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AUTOMOTIVE INDUSTRIES
The AUTOMOBILE

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ATWATER KENT

Ignition, Starting and Lighting

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THE particular care observed in building the several units of Atwater Kent Ignition, Starting and Lighting systems insures maximum performance under all conditions. No effort is spared to make each part as nearly perfect as possible.

Though the units are necessarily fine, to attain such exact performance, they are noted for their sturdy durability. They will outlast the motor.

ATWATER KENT MFG. COMPANY

Dept. A. I.

Philadelphia

Entered as second-class matter Jan. 2, 1903, at the post office at New York, N. Y., under Act of March 3, 1879.

Have you Loganized?

Many of the foremost car manufacturers have adopted Logan Fly Wheel Ring Gears as standard equipment.

In so doing, with only an insignificant increase in production cost, they have eliminated a serious car weakness.

For, whereas the old type cast iron fly wheel gears, cast integral with the fly wheel, were always noisy and always prone to strip and batter under normal treatment — these hardened heat treated steel gears, not only perform quietly and smoothly but are absolutely immune to battering and stripping, no matter what the treatment.

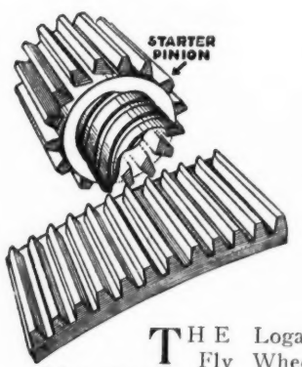
Furthermore, the Logan installation is not difficult. It is simply a matter of casting the fly wheels without gears and shrinking on the Logan rings.

You, too, can adopt Logan Ring Gears to advantage. Send your fly wheel blue prints and get our estimate and ask for the catalog showing standard sizes.

KAUFFMAN METAL PRODUCTS COMPANY
BELLEFONTAINE, OHIO

The Logan Ring Gear teeth are rounded to an angle of 45° leaving a 1/16" land — a design which was developed in collaboration with one of America's greatest Starter manufacturers — and which affords quietness of mesh and maximum strength in each tooth.

LOGAN FLY WHEEL RING GEARS



THE Logan Fly Wheel Ring Gear is made of a bar of 1035 S.A.E. steel, shaped to a ring, heat treated and electrically welded at the joint. It has no weak point. The gear teeth are then cut to accurate pitch and given a scientifically correct chamfer, which insures a perfect mesh with the starter pinion. As a final insurance against trouble the whole ring is hardened.

AUTOMOTIVE INDUSTRIES
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VOL. XLVIII NEW YORK—THURSDAY, MARCH 22, 1923 No. 12

Percentage of Ford Gain Slips Behind Other Leaders'

Ratio of Chevrolet increase eight times as great last year in comparison with 1921. Other big producers also take long strides. Sixteen companies make 92 per cent of cars in 1922. Why small concerns have their own distinct field.

By James Dalton and Harry Tipper

ONE of the most amazing features of the record-breaking passenger automobile production in 1922 was not the gain made by Ford over the preceding year, great as it was, but the much larger percentage of increase recorded by other leaders of the industry. The Ford output is so tremendous that a jump of 225,000 units in a year is impressive, but other manufacturers came ahead much faster in relation to 1921. It is the percentage of increase rather than the volume of increase which counts.

Ford's gain in 1922 over the previous year was about 27 per cent, while the gain of Chevrolet was 220 per cent. Other gains among the leaders last year as compared with the previous year were 75 per cent, 73 per cent, 62 per cent, 98 per cent, 200 per cent and 95 per cent. It will be seen, therefore, that so far as relative increase in business is concerned, other large producers did better than Ford.

CURSORY examination of the figures may give the impression that all but a comparatively few companies in the passenger car field are weaklings, but such is not the case. There are many small manufacturers whose output is insignificant when totals are considered, who are fully as strong, in proportion, as their big brothers.

Ford's proportion of the 1922 total was 47 per cent, a shrinkage of 13 per cent from 1921, and 1 per cent less than in 1920. If any inference is justifiable from these facts, it is that Ford's share of the nation's output will slowly decline in the future with a corresponding advance by other makers.

The Ford market may be bottomless, but it is becoming evident the same is true for other makes of cars in the low price classes. It may well be that these companies are beginning to get the benefit of the first buyers' market cultivated by Ford.

Analysis of 1922 production discloses some interesting facts. The number of companies producing all of last year, or part of the year, was 106. The total output was 2,334,000, but the sixteen companies in the field which made more than 20,000 each, turned out 2,152,000 of the grand total, or a little more than 92 per cent. Ford made 1,100,000 and the fifteen other biggest producers 1,052,000. The remain-

ing ninety companies aggregated 182,000 cars.

A survey of the figures discloses these facts:

There were twenty-five companies which made less than 100 each.

There were twenty-four companies which made from 100 to 500.

There were five companies which made more than 500 but less than 1000.

This makes a total of fifty-four companies, or a little more than half, in the less than 1000 class.

Sixteen companies producing from 5000 to 15,000 each made a total of 128,000.

Adding this output to the 2,152,000 of the leaders, it is found that thirty-two companies made 2,280,000 of the grand total of 2,334,000.

The remaining seventy-four companies made 54,000 cars.

Nineteen of these companies with production ranging from 1000 to a little less than 5000 had an aggregate output of 42,000.

The remaining fifty-five manufacturers had a combined output of 12,000 or an average of about 200 each.

Strangely enough there were only three companies in the class between 10,000 and 15,000 and one between 15,000 and 20,000.

In any study of production figures, serious consideration must be given to Ford. His passenger car output of 1,100,000 last year was 47 per cent of the exclusively domestic total. His production in 1920 was 920,000 or 48 per cent of the total of 1,906,000 and in 1921 it was 875,000 or 60 per cent of the total of 1,459,000. Other manufacturers, therefore, made a substantial gain last year in respect to the total. It is possible they lagged in 1920 because they did not cut prices as promptly as he.

There were four companies in 1920, in addition to Ford, which produced in excess of 100,000 cars, in 1921 there was none, although three were almost tied at 80,000. Last year there were again four with one other within 5000 of the mark.

ANALYSIS of the production figures for 1920 shows that approximately 30 per cent of the companies in the field produced less than 1000 cars. In 1921 the percentage was approximately forty-eight and in 1922 it was actually fifty-one. This would seem to indicate that in 1920, the second best year on record, the major companies were not able to come as close to meeting the demand as they were in 1922, which broke all records.

In 1920 there were fifteen companies which made more than 10,000 cars; in 1921 there were twelve and in 1922 there were twenty.

One interesting fact in connection with 1922 production was that Chevrolet established a new high water mark, next to Ford, with 240,000. This was 22 per cent of the Ford output. The best previous record was made by Overland with 140,000 in 1916 or 37 per cent of the Ford production of 534,000 for that year. Adding the output of other companies in the same general price class we get another 10 per cent of the Ford business. This would give a total in this class of almost 1,500,000.

Some conception of the expected market in this field can be gained from the fact that Chevrolet has set a mark of 500,000 at which to shoot this year while Ford expects to break all records. Durant expects to get into really big production with the Star in the near future and Gray output is being expanded.

Buick output last year was 139,000, one other company exceeded that figure slightly and another was well over the 100,000 mark with still another just under it. The largest production in 1920, next to Ford, was 130,000, with one other company only 4000 under that figure. The highest in 1921 was 81,000 with another company at 80,000 and a third at 79,000.

CURSORY examination of the figures may give the impression that all but a comparatively few companies in the passenger car field are weaklings, but such is not the case. There are many small manufacturers whose output is insignificant when totals are considered, who are fully as strong, in proportion, as their big brothers.

The balance sheets of some of these companies, with relatively small output, are revelations. They are stronger financially than a good many larger companies. They never have sought volume production but have been content with substantial profits on a small business. Many of them have distinctive lines which appeal to a certain clientele while others seek sales in a comparatively small territory with small marketing costs.

While it is true that some small companies are weak financially, it is equally true of some companies in the larger production groups.

Many persons are inclined to draw the conclusion from these conditions that further consolidations will be necessary and that the small concern has a very uncertain future in the manufacture of passenger cars. This conclusion is not justified from the facts, however, although the circumstances may seem to point that way.

In the growth of any business the value of the commodity is much the same during the experimental era. The manufacturing and marketing possibilities are limited by the uncertainty of the business and the difficulty of development. The differences in price do not count for much as the product is not stabilized.

After the usefulness of the product has been sufficiently demonstrated and the market begins to absorb it in quantity, the continued growth depends upon ability to meet the necessities of each individual section of the market.

NO commodity can come into widespread use unless a very large percentage of its volume can be manufactured for relatively small prices. The population of this country is very largely composed of industrial workers and farmers, small shopkeepers, etc. Not less than 75 per cent of the population live on incomes sufficiently small to emphasize the price necessity.

As the automobile business has grown, the development has opened up new markets by bringing the car within the purchasing range of more people. Ford gained his place by making car ownership possible for millions of people, for whom that ownership previously had been only in the range of desire.

The price market is always the largest market because

THE price market is always the largest market because persons of small incomes must always limit their purchases by price. Their desires are not thus limited. . . . Just as soon as the income will allow it the individual desires begin to come into play. . . . In these sections of the market, small as they are in comparative total volume, many manufacturers succeed because of the increased play in the diversity of desire, taste and selection.

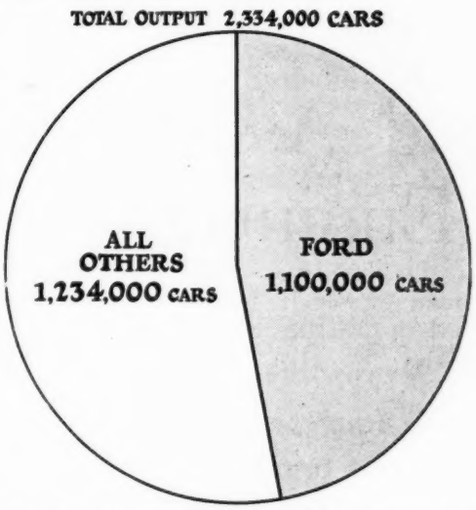


Chart showing Ford production compared to the output of all other manufacturers

persons of small incomes must always limit their purchases by price. Their desires are not thus limited and consequently, the price limitation is constantly emphasized by the attempt to make the desire and the income meet on some common ground of purchase.

These people must accept uniform, standardized products. Furniture, clothes, automobiles, etc., are all of the standardized and uniform variety. For this market quantity production is necessary.

Just as soon as the income will allow it, the individual desires begin to come into play. These individual desires make for diversity. Furniture, clothing, pictures, etc., must be different in some degree because the growth of the desires is toward diversity.

IN these sections of the market, small as they are in comparative total volume, many manufacturers succeed because of the increased play of the diversity in desire, taste and selection. The automobile business is just coming into the area where these habits develop their effect upon the marketing.

The principal desire has been to own a car. The other ideas are growing up and exercising an increased force in connection with the buying.

Size of manufacturing establishment is the result of supplying an enormous market and not the reason for it. Because the most active buying sentiment has the desire to possess a car, the manufacturer who put out enough cars at a price available for possession met that necessity and reached great production.

There will be opportunity for several manufacturers in this class, if they are intelligent, because some selection will become more important to the buyer even here.

MANUFACTURERS reaching the next selection of buyers will get big production, although not nearly as large as the efficient producer in the previous field. More manufacturers will be required for this area because the influence of diversity becomes greater.

As the section becomes smaller and the buying power of the individual greater, the influence of individual diversity becomes greater and more manufacturers are required to meet the buying demands on a smaller production basis.

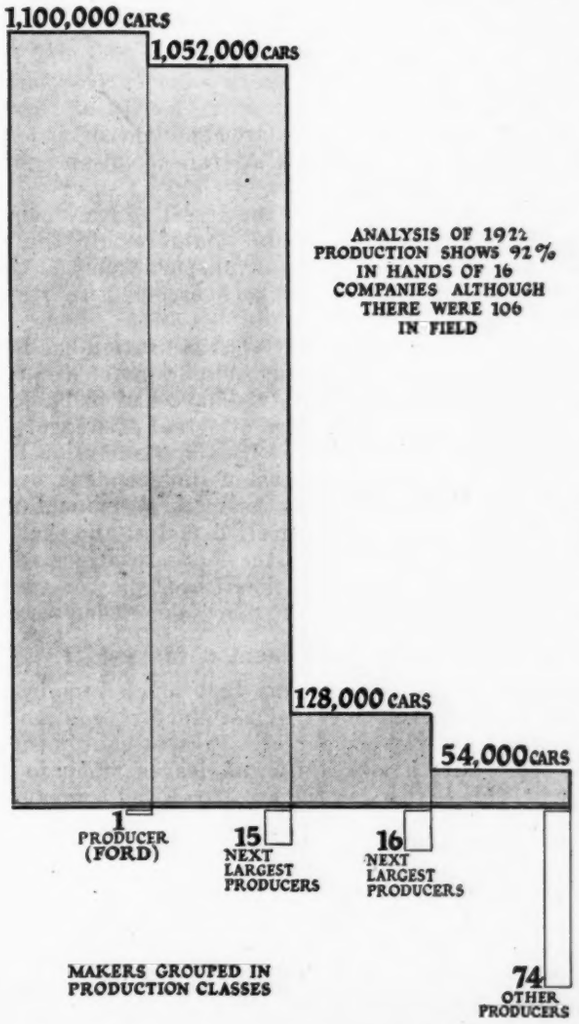
In all lines of commodities reaching the general consumer, the same is true. A few concerns do the large volume with the price buyer. More concerns divide the production in the next section, and so forth, until frequently there are more manufacturers dividing the high quality and price business than any other.

It is probable that the present condition indicates the passing from the old condition of buying a car, to the new condition of buying the kind of car desire dictates with its diversified buying requirements.

There always will be room in the field for a considerable number of small, well managed companies, producing a highly meritorious product. While America has gone farther than any other country in quantity production, it is a highly individualistic country. Just as no one wants standardized clothes, if they can afford any other kind, so no one wants standardized motor cars. Obviously, however, it is easier to gratify personal taste in clothes than in automobiles.

THE smaller companies will be wise if they give careful consideration to these factors rather than strive desperately and incessantly to increase production and overtake some of the larger manufacturers they may regard as rivals. Size is not the sole measure of success. It is quite possible to make a satisfactory profit on a car a day provided the plant is not keyed to a larger output.

Analysis of the production figures presented herewith is of dual interest. In the first place, it shows that the lion's share of the business is going to a comparatively few concerns but it is equally impressive in the evidence it gives that a larger number of companies can live and prosper with a comparatively small aggregate output.


1,100,000 CARS
1,052,000 CARS
ANALYSIS OF 1922 PRODUCTION SHOWS 92% IN HANDS OF 16 COMPANIES ALTHOUGH THERE WERE 106 IN FIELD
128,000 CARS
54,000 CARS
1 PRODUCER (FORD)
15 NEXT LARGEST PRODUCERS
16 NEXT LARGEST PRODUCERS
74 OTHER PRODUCERS
MAKERS GROUPED IN PRODUCTION CLASSES

Analysis of car production in 1922 *by groups arranged according to size of manufacturer's output*

Street Railways Need Assistance of Automotive Engineers

Necessity for closer cooperation between operating companies and the industry stressed at S. A. E. Metropolitan Section meeting. More flexible equipment must be developed. Public utilities will remain dominant factor in mass transportation.

CLOSER cooperation is needed between automotive engineers and street railway operating organizations. Electric lines are finding it necessary to coordinate flexible transportation equipment, such as trackless trolleys and motor buses, with their existing facilities. To do this successfully they will have to get hearty assistance from the men who design automotive products. These were the dominant thoughts developed at the meeting of the Society of Automotive Engineers Metropolitan Section held in New York last Thursday.

Presentation of a paper on trolley buses and flexible vehicles for street railway service by William P. Kennedy of the Kennedy Engineering Corp., New York, gave rise to discussion of the relative merits of the trolley bus and gasoline-electric bus versus the orthodox gasoline motor bus. Each type of transportation equipment had loyal champions.

Many representatives of the street railway companies maintained that their group would remain the principal factor in rendering mass transportation and that motor bus competition would be overcome. In respect to this Kennedy said:

"Solidity and permanency of organization has been absolutely necessary and many obligations of a municipal, political and regulatory nature have had to be complied with as requirements to legal or actual existence. Therefore we should feel pretty sure the assumption that the apparent temporary success of independent operators forebodes displacement of the more permanent railway organization service is entirely delusive, and that within the lapse of a short period these organizations will seriously determine upon a rational program for graduated advance in directions of the newly demanded service."

Present Equipment a Makeshift

Consensus of opinion was that much remains to be done in the development of satisfactory equipment for the street railway companies. Present equipment is for the most part a makeshift and leaves much to be desired. This is the way the street railway companies feel about it. Kennedy summed it up this way:

"Body and chassis requirements peculiar to mass transportation is a subject which, from the standpoint of the designer and the manufacturer, has not yet received much consideration, or at least it has been sidetracked by the necessity of making use of material and equipment designed for other purposes, but constituting the only kind immediately available for application to motorbus construction.

"Is it any wonder then that we find the conservatively trained executives in public passenger transportation fields in such an attitude of reluctance to adopt this misfit equipment which violates from every point of consideration the tradition of their industry as developed by years of experience? We should acknowledge immediately the radical difference existing between their experience and ours as automotive engineers."

Kennedy outlined the requirements in design necessary for flexible equipment. By doing so he emphasized the necessity of getting away from the practice of following blindly motor truck design. His suggestions were as follows:

Requirements in Design

"Demand principally exists for large carrying capacity with low operation cost and one man control. Other features sought are:

Low center of gravity.
Low floor.
Large seats.
Wide aisles.
Compensating spring suspension.
Accessibility for maintenance and repair.
In operation there is need for smooth acceleration, ample power, adequate brakes and permanency of the power plant under continuous operation.
Desirable additions in equipment features are:
  Detachability of powerplant.
  Season body changes.
A fundamental necessity is:
  Interchangeability of parts, and
  Standardization of the units employed.

"These requirements cannot be readily supplied in machines designed primarily as trucks. Their special service requirements demand correspondingly special designs.

"A combination tractor and trailer design is not entirely new in passenger transportation, and it certainly has many advantages worth considering. This type of design will provide the following features:

Three axles for load distribution of passengers and powerplant.
Three sets of springs for flexible suspension.
Steering on all six wheels resulting in short turning radius.
Brake equipment application to two axles as well as drive shaft.
Power plant equipment confined to tractor part, and consequent freedom from power equipment apparatus in trailer passenger section.
This allows of wide, low hung body, comfortably accommodating both seated and standing passenger.

Pneumatic tire equipment is made serviceable reducing unsprung wheel weights and operation cost.
Tractor may be detached from trailer section for ease of repair and maintenance.
Trailer bodies of open and closed types may be interchanged.
In case of accidental damage only one part of equipment put out of service.
Carrying capacity up to 100 passengers may be provided for within reasonable vehicle length.

"With such brief summary of this particular design it will be readily seen that in meeting the demands for larger passenger capacity than is usually supplied by the normal 4-wheel vehicle there is opportunity to extend the load space and distribute its weight on a rational basis. Extending the length of vehicles usually handicaps their turning ability, but with three axles disposed along the length of the vehicle, and all of them performing turning functions, controlled or governed in a specific manner any reasonable turning radius required for city operation can be attained. The consequence of all these features is that an approach is made to meet the demand which the street railway executive asserts exists in the necessity for handling a large number of people comfortably and flexibly with one man control."

Possibilities of using the trolley bus equipped with a trailer for interurban freight haulage, package transfer and store-door-delivery was touched upon by Kennedy. He stated that the establishment of a permanent cooperative relationship between railroads and railways for the conduct of store-door-delivery between the railroads and their customers would warrant a considerable investment in overhead structures for flexible operating equipment.

Monopoly Service Best for Community

G. C. Hecker of the American Electric Railways Association stressed the point that the community is best served by a monopoly service and that the trolley bus is the best equipment for use in opening up new territories with transportation. In regard to motor bus competition he contended that motor buses operate over preferred routes at the present time and that as the service is extended they will have to include some very lean routes which will tend to make the cost of operation higher. Another factor which enters into the comparison of electric railway and bus transportation he said is that of the greater tax which the electric railways are forced to pay.

Automotive engineers must consider certain factors in future design, Hecker said, and these are:

Development must permit standardization.
Application of proven safety devices must be feasible.
Greatest possible consideration must be given to passenger comfort.
Study of exit and entrance facilities needed to permit rapid loading.
Design must permit one-man operation.

In his paper Kennedy stated that the next logical step in the development of more flexible equipment would be the inclusion in the trolley bus of a secondary source of power for supplemental operation. This might be either a gas engine equipment or electric auxiliary in the form of a storage battery chargeable direct from the line or at a power station. Reuben E. Fielder of the Fifth Avenue Coach Co. discussed this statement by reference to past experience with the gasoline-electric vehicle in the service of the Fifth Avenue company. He maintained that this type of vehicle is not as satisfactory as the straight gasoline bus, that its acceleration is too slow and its gasoline consumption and weight are greater. The gasoline bus came to help out the electric vehicle, he said, and railway companies are buying gasoline buses and finding them more economical in operation.

Almost every speaker stressed the need of greater study of design of new equipment. Those who made no direct statement to that effect made indirect reference. C. M. Kellogg, special equipment engineer of Stone & Webster, said that the problem of producing comfortable transportation is up to the automotive engineer and that the latter now realizes that special equipment is necessary.

Town Planning to Relieve Congestion

F. C. Horner, a transportation engineer with the General Motors Corp., said that there is much to be desired in existing equipment to meet requirements. Present designs he said are makeshifts. He quoted an official of the London Omnibus Co. as saying that bus chassis requirements are entirely different from truck chassis and that there is a lack of realization of this in the United States.

Horner brought out another interesting factor. He stated that the solution of the transportation problem lies in proper planning of towns to reduce unnecessary transportation. This, of course, is a very difficult proposition for large cities, but offers possibilities for growing urban centers.

Street railway companies are not antagonistic to motor bus equipment. They see that few motor bus operating companies are making a profit and the railway companies must adopt profitable equipment. This was the contention of C. J. McPherson, sales manager of the J. G. Brill Co. The street railway companies are out to learn, he said, hence they try out the trolley bus. At the present time the motor bus is not what they need, neither is the trolley bus. The ultimate equipment has yet to be designed. He maintained that the storage battery vehicle if practical offers advantages to the railway engineer and is much to be desired. The trackless trolley, he said, has certain political advantages because it must run on a fixed route. It can't be removed from the State overnight, hence responsibility can be fixed. It can be taxed and therefore franchises are easier to obtain.

Real Estate Values Enhanced

A loyal champion of the trackless trolley appeared in the person of Prof. Morton Arendt, representing the City of New York in its trackless trolley operation. Arendt told in detail about the trackless trolley installation on Staten Island and its great success. He contended that this type of equipment is the cheapest method of transportation for undeveloped localities where overhead wires are not restricted. Real estate values, he said, increase along the lines of a trackless trolley where they do not with motor bus installation because the latter does not convince people of its permanency or stability. He cited Staten Island and Baltimore installations as examples.

Kennedy's plea for closer cooperation between automotive equipment engineers and the street railway companies was heartily endorsed by Joseph Anglada, consulting engineer. He considered the time well chosen for bringing forward this move because the gasoline bus may not be the solution to the mass transportation problem. He urged the automotive engineer to consider whether he is working toward the best commercial solution.

Just Among Ourselves

WASHINGTON has taken the veil, politically speaking, for the first time in many, many dreary months. Congress has been in session so long people had begun to look upon its run as promising to be longer if not so successful as that of "Lightnin'" on Broadway. Almost everybody who was holding a political rather than a working job left town when the lawmakers went. Secretaries Hughes and Hoover didn't go, but they seem to enjoy working. At any rate, they work harder than any clerks in their departments.

HOOVER is absolutely indefatigable. It has been highly gratifying to observe of late, that Mr. Harding leans harder on his Secretary of Commerce than he did at the beginning of the administration. It has been demonstrated that Hoover has an exceedingly hard head on his shoulders as well as an uncanny knowledge of what's going on behind the scenes not only at home but abroad.

REVERTING to Washington, with Congress gone (we were about to say in times of peace), there is an amazing shrinkage in the floating population. It's even possible to get a room in a hotel without waiting until 4 p. m. before being told confidentially that you can have one. As the number of guests decreases, however, the per capita charges go up, so the budget always balances—that is, the hotel's budget. The maitre d'hotels and head waiters have acquired piratical strides reminiscent of Captain Kidd.

MUCH has been heard about the strict observance of precedence in diplomatic circles at the capital but it has been extended to automobile licenses in the District of Columbia. As nearly as we can get it, a certain number of licenses go to the White House set, with definite quotas to the army, the navy, the Supreme Court, ambassadors, senators and prominent politicians.

IF the White House gets the first fifty numbers and the ambassadors the second fifty, and so on down the scale of precedence, the driver of a car with license No. 78 turns into the ditch when he sees No. 48 coming because he is outranked by the lower license. Traffic officers are supposed to regulate traffic with due regard for precedence. It sounds complicated, but its simple after you get the hang of it.

WHILE Washington may be quiet with Congress quiescent, it becomes darkly mysterious. Everything is shrouded with secrecy. No one talks above a whisper. Even the "canned" interviews of the paid propagandists, who never sleep, are passed around as though they contained priceless gems of wisdom. It is next to impossible to get a direct answer to any kind of question from any one who is in a position to know what the answer should be.

PROPAGANDA is a menace to the peace of the world. And that isn't a joke. If a few people would try telling the plain truth for a while, without expecting a publicity man, whatever he may be called, to put over a twisted version which may be based on fact but resembles the truth only as a cow resembles an elephant, the country would be a lot better off.

THIS goes for the automotive industry, too. Getting at the truth is no job for a lazy man to tackle. It's about as easy as breaking into a bank vault. Really, it's surprising how few people there are who are willing to loosen up on information unless it has a "reverse english" on it. The sad part is that when your friends do tell you they usually pledge you to secrecy. The result is that you're constantly looking for jokers or trying to keep from betraying "confidential" information which almost everyone knows all about.

THERE may be some topics under discussion at this time which are free from the taint of propaganda but we have difficulty in recalling them at the moment. In relation to national problems, altogether too little consideration is given to what is best for the people as a whole. The farm bloc operates on the theory that what's good for the farmer must be good for the mill worker. If it isn't, the mill worker is out of luck.

TAKE the subject of transportation, for example. It is an open secret that the survey which is to be undertaken by the Chamber of Commerce of the United States was instigated by the Administration. It is designed to evolve common sense ideas for the coordination of transportation, which can be hammered into the heads of the railroads. This is expected to improve service and thereby make tougher sledding for the radicals' government ownership program.

THE purpose of this survey is entirely commendable and it may do much to improve the

More or Less Pertinent Comment on Topics of Current Interest to Men in the Industry

transportation service, BUT it had its Genesis in political expediency. We have heard much for a long time about "rotten railroad service," but nothing concrete was done about it until a lot of so-called radicals with government ownership ideas were elected to Congress.

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NOW transportation is a burning theme. As a matter of fact, its temperature is no higher than it has been for years. The thermometer merely has been laid on the hot water bottle of politics. It's a subject which touches every man, woman and child in the country, but political considerations are wrapped around even a problem of such vital importance as this.

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THERE may be some duplication of effort when the Chamber of Commerce committee gets under way, for surveys of the whole field of transportation are to be undertaken simultaneously by the National Transportation Institute, organized by Bird Robinson, president of the Short Line Railroad Association; the National Industrial Conference Board, which has been presided over for a long time by Magnus Alexander, and the Federated American Engineering Societies.

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INCIDENTALLY, Alfred H. Swayne, vice-president of General Motors Corp., will be chairman of the subcommittee of the Chamber of Commerce, which will survey the subject of highway transport and its coordination with rail and water service. Associated with him will be representatives of the automotive industry, waterways, electric railways and big shippers. "At the beginning" the sessions of the committee will be executive in character.

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REPRESENTATIVE SIDNEY ANDERSON, who was chairman of the Joint Committee on Agricultural Inquiry, has consented to take an active part in getting the National Transportation Institute started, but it has been with the distinct understanding that fair and impartial consideration would be given to the transportation problem. Sharing the work with him will be Donald R. Conn, who was associated with him in the agricultural inquiry, and James R. Howard, president of the American Farm Bureau Federation.

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IN connection with transportation surveys, the importance of those instituted by the Bureau of Public Roads should not be underestimated. They are likely to explode several cherished theories relative to highway building and highway transport. One of them has to do with the effect of road construction on real estate values. It is said this inquiry shows a very sharp appreciation in land values when the road is raised from dirt to gravel construction, but only a comparatively small additional increase when the road is hard surfaced with macadam or cement.

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IF this is true, it may indicate that heavy trucks, which are the chief beneficiaries from hard surfaced roads, should pay a greater portion of the expense of constructing them. Light trucks can and do get along very well on gravel. Incidentally, the traffic survey made by the bureau in two New England States shows that heavy truck traffic sticks pretty close to the main roads and doesn't wander off on the secondary system to any great extent.

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THIS mention of highways brings to mind the fact that Senator Edge of New Jersey is trying to put over a plan whereby Thomas H. MacDonald, the able Chief of the Bureau of Roads, would become highway commissioner of New Jersey. Edge proposes a $25,000 salary, while the Chief now gets $7,500 from a grateful government. We couldn't blame MacDonald if he were tempted, but it would be a sad day for highway improvement if he left the bureau.

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SOME new viewpoints on highway construction and traffic regulation may be voiced at the conference called by Governor Pinchot of Pennsylvania at Harrisburg late this week. A score of states will be represented by their highway superintendents. They are the men, in the last analysis, who determine good roads policies and they reflect to a large degree the opinions of the people in their states because they cannot be unmindful of political considerations.

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IT is interesting to note in cable messages from Rome that the transport group of the International Chamber of Commerce adopted a resolution designed to impress upon the governments of the world "the necessity of promoting better public highways for motor traffic." The resolution was proposed by the American delegation and the American delegation includes A. J. Brosseau, a member of the highways committee of the N. A. C. C. as well as a director of the Chamber of Commerce of the United States.

J. D.

Four-Wheel Brakes Extensively Used in France, Italy and Belgium

Sixty-seven makers employ them on one or more models of passenger car chassis. Perrot system used on 42 makes and Adex type on 14. Great variety in hookup and method of operation but some standardization is being attempted. Servo mechanisms increasing.

By W. F. Bradley

NO feature of European automobile construction has received so much attention during the last two years as brakes. In France, Italy and Belgium the suitability or practicability of four-wheel braking systems has ceased to be a matter of controversy, for the great majority of manufacturers use four-wheel brakes or, if not using them, offer no other explanation than increased initial cost. Up to the present, England has remained severely aloof, but it is known that twelve important firms are experimenting or negotiating with the holders of brake patents and may be expected to come out next season with four-wheel brakes on their cars.

Credit must be given to France for the first practical adoption of four-wheel brakes, although England and Italy can each claim to have led in the initial and experimental stages of the movement. Considering only France, Italy and Belgium, it would be an exaggeration to claim that the majority of cars produced in these countries have four-wheel brakes, for the big production models of Citroen, Renault, Fiat and Berliet are not fitted with this type of brake. Altogether, sixty-seven automobile manufacturers in these three countries make use of four-wheel brakes on some or all of their models; this number represents a majority of the makers and of the types produced, but not of the number of cars produced. The outstanding feature of the development during the last year is the adoption of this system of braking on cars of nominally 10 hp., or, expressed in piston displacement, of 90 to 122 cubic inches.

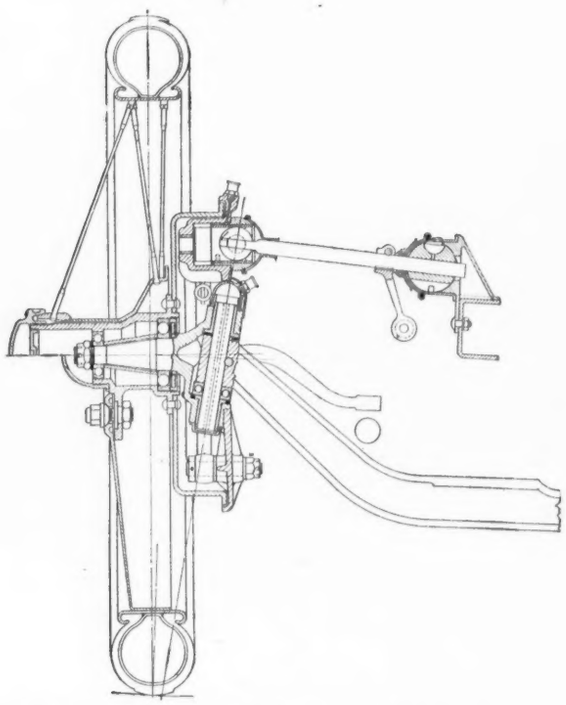


Fig. 1—Front wheel brake on Voisin, a good example of Perrot partly standardized construction

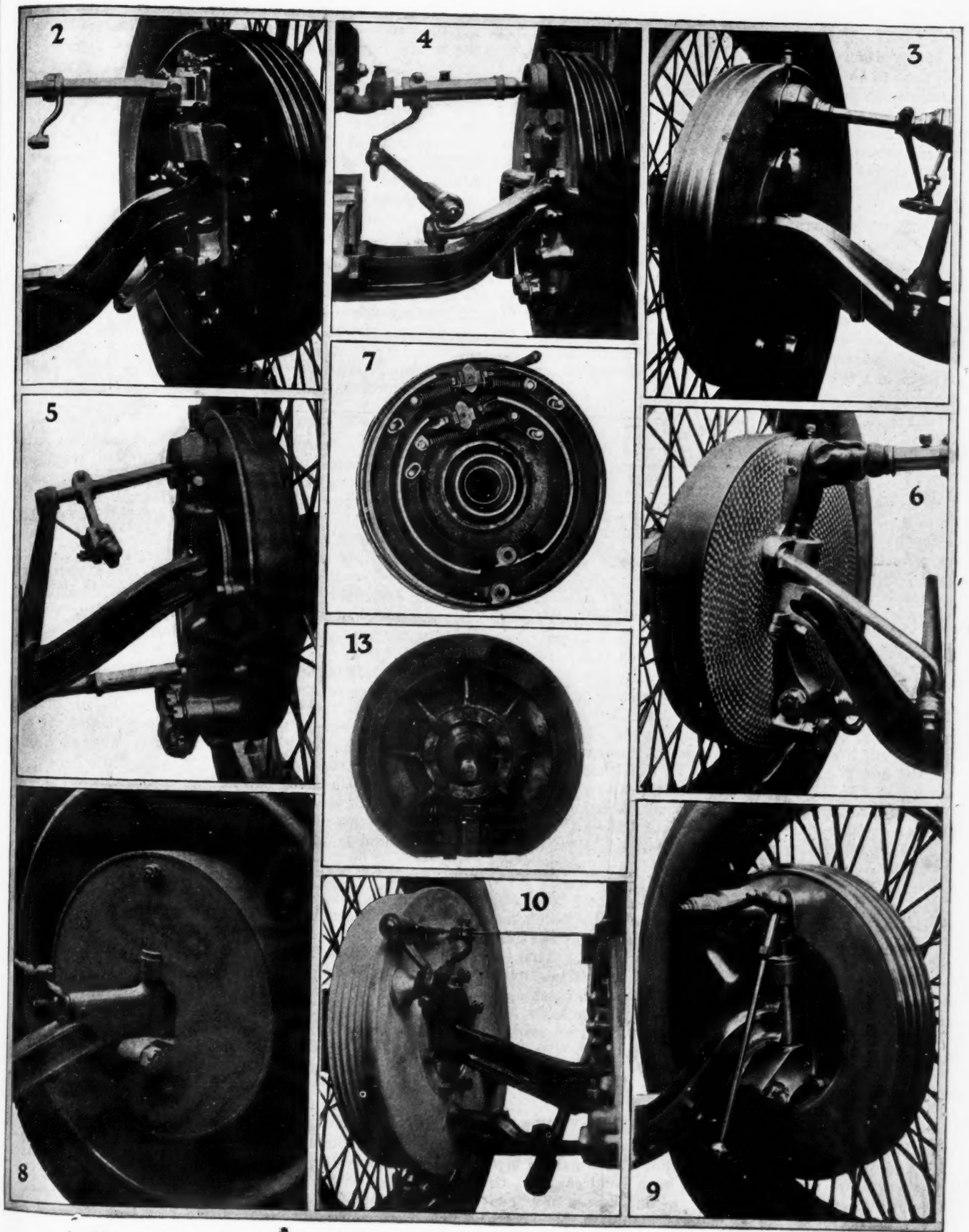
It is possible to divide these 67 different makes into four categories, so far as the class of brake is concerned: (1) The Perrot system with a universally jointed brake camshaft carried on the frame side members constitutes 42 of the whole; (2) the Adex-Excelsior and Isotta-Fraschini types, with the brake camshaft mounted in the axle, has 14 representatives; (3) the type with brake camshaft mounted directly on the steering knuckle, or similar types, is found on nine makes, and (4) the hydraulic system is used on two makes.

Great Originality in Layout Detail

Although the same general characteristics are to be found on all the 42 makes of cars equipped with brakes built under Perrot license, there is a wealth of originality in the details of layout, methods of adjustment, use of equalizers, etc. Perrot has standardized front axle and front brake construction, and one French company is supplying complete front units, with the result that the same axle, the same type of universal joint brake camshaft and the same method of attachment of this to the frame can be found on a number of cars. One of these standardized types, as used on the 10-hp. Voisin, is shown on Fig. 1. This standardization has not been extended to other parts than those connected with the front axle.

The first two production jobs with front-wheel brakes were Hispano-Suiza and Delage. The former made use of a telescopic shaft with yoke ends at 180 deg. forming a universal joint. The pins are provided with lubricators but, as shown in Fig. 2, no attempt is made to inclose them in order to protect them against dust and wet.

A now more generally adopted type is that first used by Delage, with a spherical universal joint at the outer end and a sliding joint at the inner end. Originally leather gaiters were used to protect these joints, but the latest practice is to use spherical-shaped aluminum dust covers, which are kept in contact with the fixed member by a light



2—*Hispano-Suiza.* 3—*Minerva, an example of the Perrot system with use of several standardized parts.* 4—*Delaunay-Belleville has telescopic brake camshaft and split bearings on frame member.* 5—*Hurtu—outer end of the brake camshaft mounted in an extension of the steering knuckle. The inner end carried in a bracket anchored under spring clips.* 6—*Delage with camshaft and brake pivots mounted on steering knuckle. Leather gaiter on universal replaced by metal dirt guard.* 7—*Concentric rear wheel brakes.* 8—*Elizalde.* 9—*Hotchkiss.* 10—*Microe and Dunamis.* 13—*Adjustable cam shoes on Excelsior.*

spring on the brake camshaft. Good examples of this are to be found on the Voisin drawing (Fig. 1) and on the cut of the Minerva (Fig. 3). These parts, being standardized, are to be found on numerous other cars.

Designs vary somewhat in the method of attaching the inner end of the brake camshaft, although the most commonly adopted system is the use of a right-angle bracket riveted to the side frame members. Delaunay-Belleville has a split bearing (Fig. 4), while on the Hurtu the inner end of the shaft is not received in the frame members, but in the eye of a vertical bracket held under the spring seat (Fig. 5). This arrangement eliminates the use of the sliding joint on the brake camshaft.

On the great majority of cars the outer end of the brake camshaft and the pivots of the brake shoes are mounted in the disk bolted to the steering knuckle and serving to inclose the brake drum. Aluminum having a thickness of about 5 mm., but heavily ribbed at the points where the pins and camshaft are received, is generally employed, although in a few cases a malleable-iron casting is used.

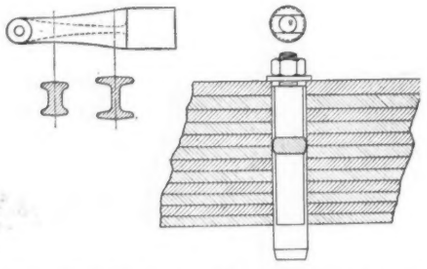


Fig. 19—*Sketch showing how front axle ends are straightened to resist torsional stresses due to use of front wheel brakes. Fig.* 20—*Center bolt for front spring on Delaunay-Belleville*

Delage has a much more costly construction with extension pieces forged with the steering knuckle to receive the outer support of the brake camshaft at the upper end and the pivots of the two brake shoes on the lower end. In this case the disk is nothing more than a thin sheet aluminum dust guard (Fig. 6). Alba and Hurtu are two less prominent makes in which the brake camshaft is mounted in the steering knuckle instead of in a disk bolted to that organ (Fig. 5). In every case brakes are internal expanding, and front axles are of the closed-eye type, variously described as the Mercedes or the reverse Elliott types.

The most general practice when brakes are fitted on all wheels is to apply the four simultaneously by pedal, and to have a separate control, allowing the set in the rear wheels to be applied independently by hand. This, of course, gives four drums and four pairs of shoes, with the possibility of applying all four or the rear set only. In practice, the hand lever is used only to lock the car when it has been brought to a standstill. The leading makers following this practice are: Talbot-Darracq, Peugeot, Brasier, Farman, Hispano-Suiza, Minerva, Voisin, Renault, Lorraine-Dietrich, Delage 11 hp., Corre La Licorne and De Bazelaire.

There is some doubt whether this arrangement complies with the law calling for two independent sets of brakes, and it is probably because of this that a few makers have left the gearset brake in position, with hand control. On the more expensive cars there is a tendency to have concentric brakes on the rear wheels, the inner set, which are, of course, inadequately cooled, being treated as emergency brakes (Fig. 7). Two sets of shoes, side by side in the same drums, are not used very extensively.

There are half a dozen cases where the pedal operates brakes on the front wheels and on the gearset, the rear wheel brakes being hand operated. Examples are Rochet-Schneider and Delaunay-Belleville. In a very limited number of cases—Chenard-Walcker, Bignan, Rolland-Pilain—the drums have been removed from the rear wheels, the braking being done on the front wheels and on the gearset.

It is frequently found that a modern braking system has been added to cars already in construction and has prevented designers working with a free hand. The explanation of some of the cases of a gearset and front-wheel brakes operating simultaneously is that the rear wheel drums were inadequate to work with the size of drum recommended for the front wheels, while the existing gearset brake was powerful. In other cases, too, the gearset brake has been left, with hand control, simply because it existed when the change was made to a four-wheel braking system; it serves primarily to hold the car in a standing position. Judging from the examples of cars of entirely new design, the systems which are likely to persist are simultaneous braking of the four wheels by pedal, or front wheel and gearset braking, without any drums on the rear wheels. At present the former system is in an immense majority.

Camshaft in Front Axle Construction

The type of construction with camshaft mounted in the front axle is more generally found on Italian or Belgian cars, the reason probably being that Isotta-Fraschini initiated this type in Italy and Excelsior in Belgium and other makers followed their example, or took up their licenses. The users of this system are Fiat, Spa and Ansaldo in Italy, and Metallurgique, Nagant, and Sava in Belgium. French firms employing this type are Ballot, Berliet, Bellanger and Mathis. Elizalde, a Spanish firm, has a modification of this type, with the camshaft in the upper portion instead of in the lower part of the axle (Fig. 8).

Intermediate between the type with camshaft in the axle and on the top of the steering knuckle is the new Hotchkiss, which has the camshaft mounted in the brake drum flange, with a horizontal lever on this shaft and rod connection from this lever to a corresponding lever on a shaft carried in the front axle (Fig. 9).

Miesse and Dunamis, two Belgian makes, have the same method of mounting the camshaft, with connection from the lever on this shaft to the brake pedal by flexible cable guided round a pulley mounted on a vertical axis above the steering head (Fig. 10). Unic and Amilcar have the brake camshaft carried in the flange of the brake drum with a lever mounted on it and operation by an internally threaded cap carried on the top of the steering knuckle. A pinch bolt with a hardened end passes through the end of the lever and makes contact with the threaded cap, adjustment being provided at this point (Fig. 11).

Brake Shoes Opened by Toggles

On last year's racing cars, Fiat opened the brake shoes by means of toggles through a lever fulcrumed on the top of the steering knuckle. A rod passed right through the steering pivot, its upper end being connected to the lever by ball and socket, and the lower end being secured to a bicycle chain passing around a sprocket under the steering knuckle. Although successful on the racing cars, this system has not been used on any stock cars (Fig. 12).

While on some of the cheaper cars pressed steel brake drums are in use, the more general European practice is ribbed aluminum drums with steel or iron liners set in, together with heavily ribbed aluminum shoes. Steel brake shoe faces, generally adjustable, are arranged to contact with the brake cam. On the Excelsior these plates are wedge-shaped. Teeth on the rear face allow of a close adjustment between shoe and cam (Fig. 13).

Cast iron is more generally used than fabric brake

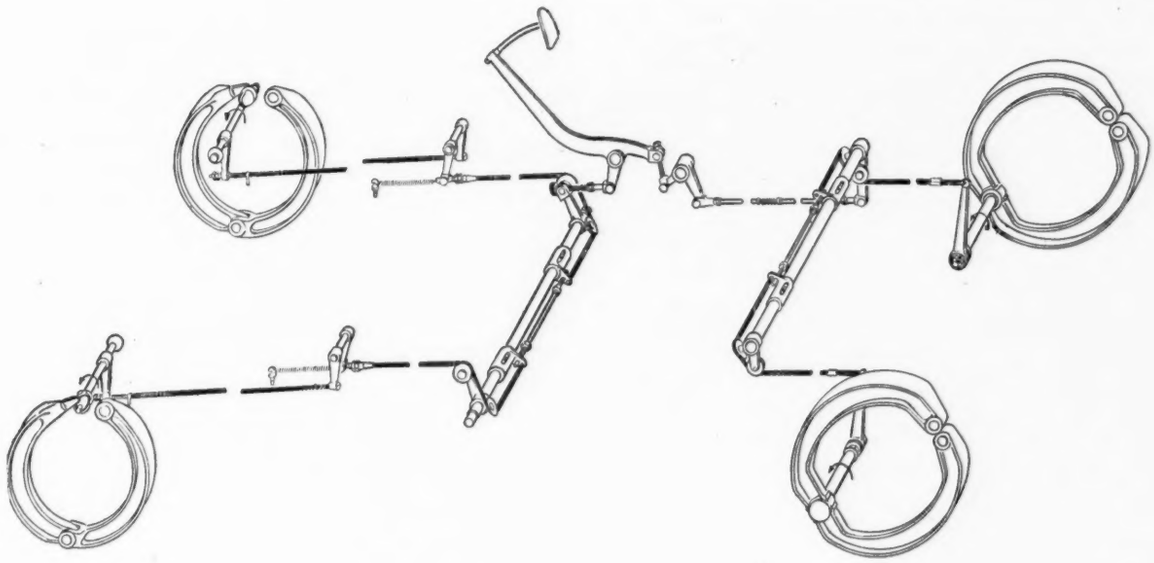


Fig. 14 *(above)—Minerva brake layout, showing type of servo brake used on front wheels. Adjustment is such as to apply the front wheel brakes slightly ahead of those in the rear*

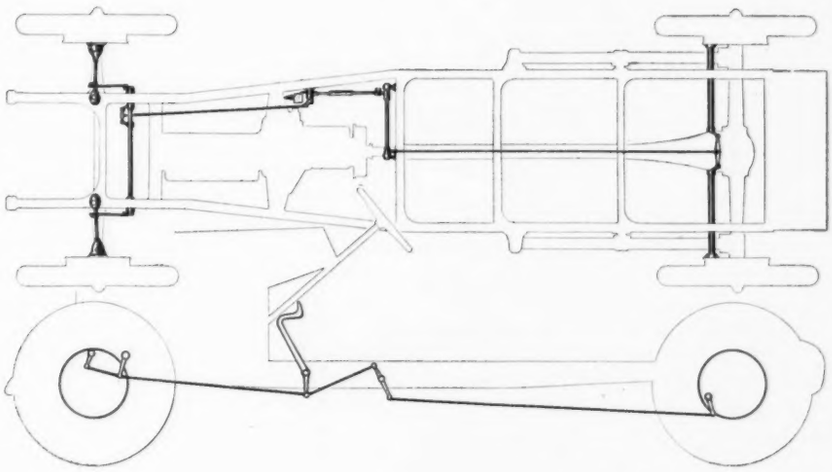


Fig. 15 *(right)—Brake layout on 10-hp. DeDion. Note use of equalizers front and rear. Brake on gearset is retained for emergency use*

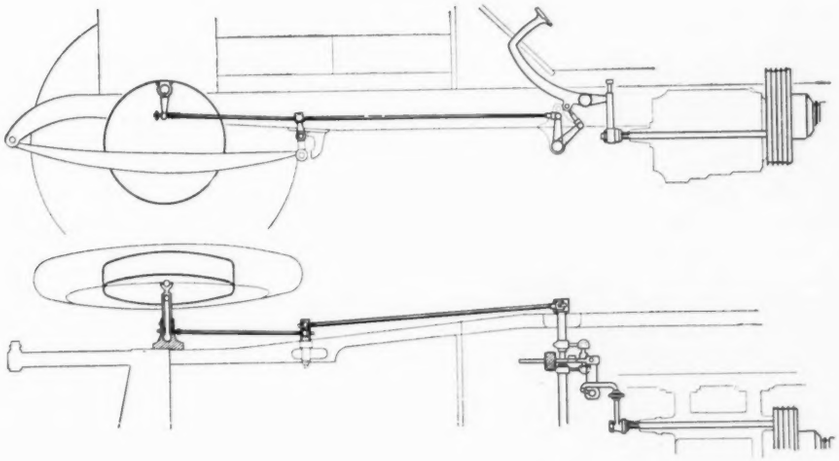
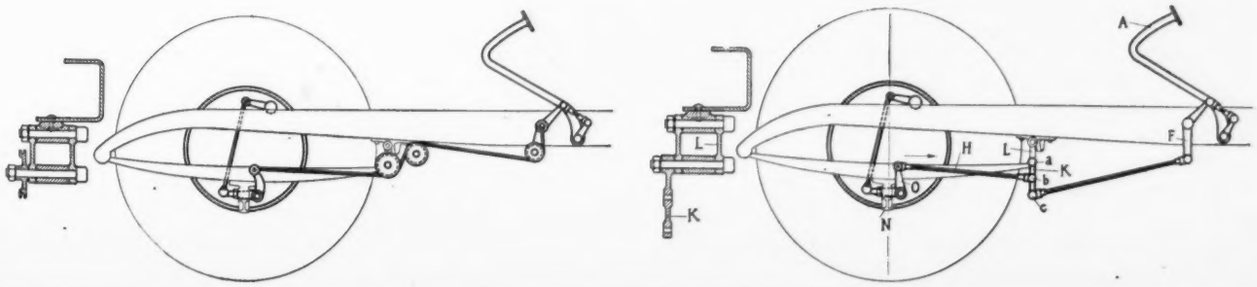


Fig. 16 *(left)—On 12-hp. Delaunay-Belleville front wheel and gearset brakes are inter-connected and applied simultaneously, rear wheel brakes being applied separately by hand*

Below Fig. 17 *(left) and Fig.* 18 *(right) — Hotchkiss devices for neutralizing the variation in center distances on brake linkage which results from spring action*



linings. Excelsior has made successful use of Ferodo and cast iron on the same shoe.

Three main sizes of drums are in general use: For light four-passenger cars of about 10 nominal horsepower (examples being 10-hp. Voisin and 11-hp. Delage), 12 in. diameter, with shoes 1.7 in. in width; for cars of nominally 15 horsepower (Brasier, Peugeot, etc.), 14 in. diameter, with shoes 1.9 in. in width; for the largest cars, capable of 60 miles an hour and upward (Hispano-Suiza, Delage, Farman, Fiat 6 cyl.), the size is nearly always 16 x 2.3 in. The tendency is toward increased diameter of drums, without any increase in the width. No cars are built with external contracting brakes.

No Uniformity in Brake Connections

There is an entire absence of uniformity in the connections between front and rear brake camshafts and the lever or pedal by means of which the brakes are applied. Cables, rods and steel ribbons, or combinations of these, are used. Brasier, who makes use of the Perrot system of braking, has a simple method embodying four cables, one from each camshaft, the two from the front being inclined and passing under the main frame members, and the two from the rear being straight, but all four brought up to two double levers mounted on a shaft received in brackets on the central cross frame member. The levers are keyed to the shaft and locked with a pinch bolt. Adjustment is by means of a wing nut on the rod going through the lever, and thus brings all four points of adjustment together under the floor boards. No equalizers are used.

A good example of the provision made for adjustment on a high-grade car is shown on the drawing of the 30-hp. Minerva (Fig. 14). In this case the pedal applies the four brakes on the wheels, the adjustment being such that the brakes on the front wheels are applied slightly ahead of those on the rear. It will be seen that on this car a type of servo mechanism is used for the front wheels, the cam pushing on one of the shoes only. When this shoe is brought into contact with the drum it is carried round by it and pushes the second shoe, pivoted to it, into contact with the drum.

Delage Brake Adjustment

Another good example of convenient brake adjustment is to be found on the six-cylinder Delage, on which flexible steel cables, 8 mm. in diameter, are used. There are four points of adjustment by wing nuts at the front and the rear. A hollow shaft passes through the lower portion of the clutch housing and is mounted in plain bushings on the lower flange of the frame members. A double lever is keyed to each end of this shaft, and each lever has at its extremity a steel pulley with a horizontal axis. The cable from the front right lever on the brake camshaft passes over the pulley, through the tube, over the pulley on the opposite end and is carried forward to the left lever. The arrangement is similar for the rear, but as the cable is longer, there is a guide under the rear spring front hanger. There being a continuous cable between each pair of brakes, no equalizing gear is required. No tools are necessary and adjustment at the front is remarkably easy. In case of a cable breakage, either both front or both rear brakes would be lost simultaneously. The brake pedal shaft is mounted on a bracket on the right side of the gearbox, with suitable lever connection between it and the hollow shaft carrying the main levers.

Another method of control worthy of description is that employed on the De Dion Boutons fitted with the Perrot system (Fig. 15). Connection is made from the lever on the front brake camshaft by means of a rod to a lever hanging from the extremity of a cross shaft under the hood just back of the radiator and ahead of the engine. There is an equalizer on this shaft, and a single rod connection up to the brake pedal.

Diagonal Control System

Diagonal control patents are claimed by Adex. This method of control is found on the Excelsior and Nagant cars, both of which use cables throughout, and also in another form on the Ansaldo six-cylinder. Although this type has the important theoretical advantage of equalizing the effort between front and rear on opposite sides, the diagonal system of braking has not an important following numerically.

Delaunay-Belleville makes connection from the lever on the front brake camshaft to a second lever mounted on the upper bolt of the front spring shackle (Fig. 16).

A patented feature on Hotchkiss cars, shown on Figs. 17 and 18, is designed to cancel out variations in length of the cable or rod connecting the movable axle with the fixed point of attachment on the brake pedal. The patent covers the use of a flexible cable passing over pulleys, or rods and levers, the latter system being employed on Hotchkiss cars. From the lever *F*, Fig. 18, connection is made by a rod to the lever *K* oscillating around the lower bolt of the spring shackle *L*. The lever *K* operates the lever *O*, mounted on the axle, by means of the rod *H* attached to *K* at its center point. Under flexure of the spring, the lever *O* is brought nearer the fixed point *E*, but as the attachment of the axle is at the center point of the spring, the movement of the point at which the lever *K* is pivoted is double that of the axle *N*. The movement of the points *a* and *b* are therefore in the ratio of 2 to 1, which is also the ratio of the length *a-c* of the lever *K* to the distance between the points *a* and *b*. In consequence, the point *c* remains invariable and the movement of the axle has no influence on the pedal *A* and the parts connected with it.

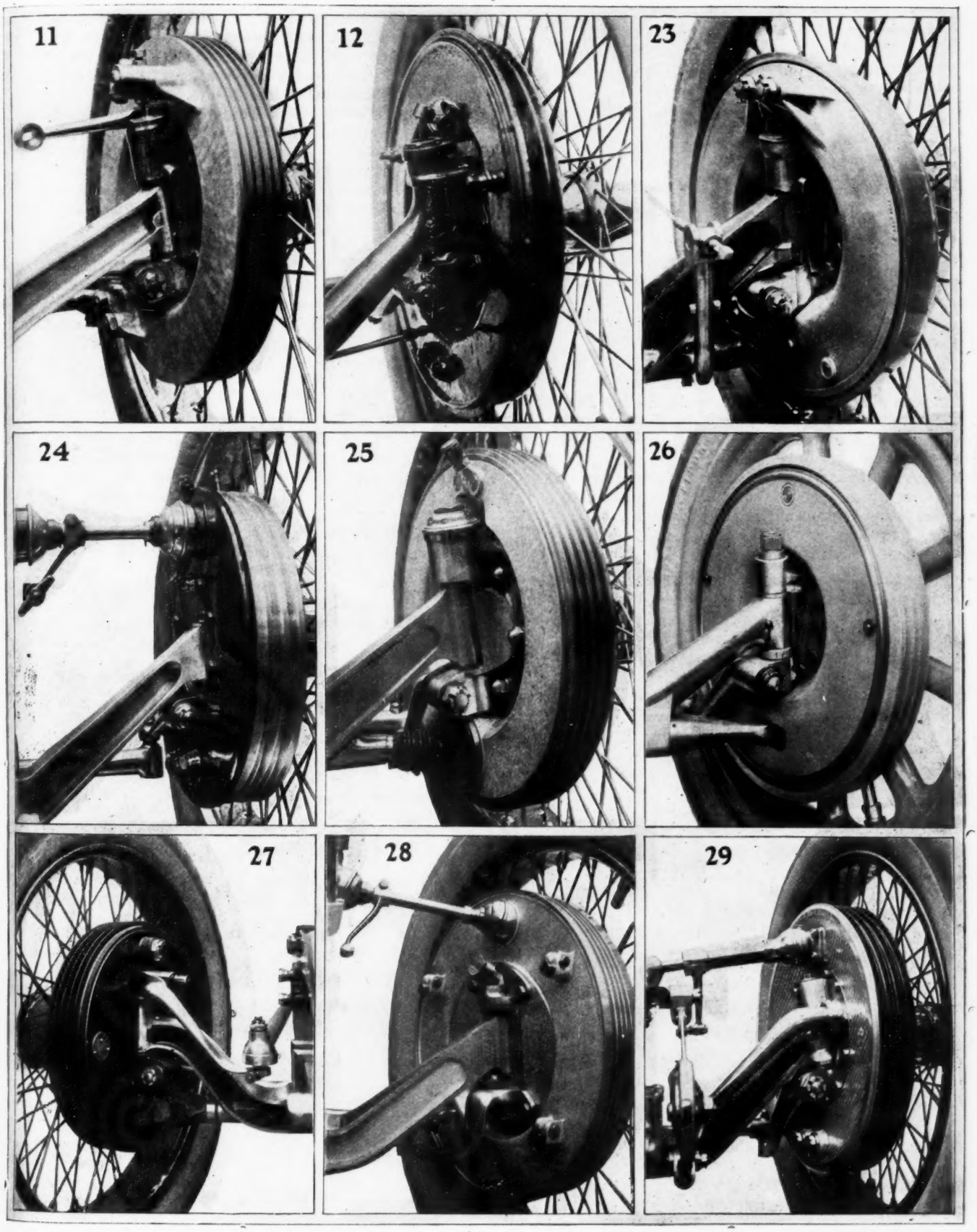
The necessity of considerably stiffening the front axles to resist the torsional stresses set up by the use of brakes on the front wheels has been realized. This was not sufficiently realized when front-wheel brakes were first used and trouble was experienced, on road racing cars in particular, by reason of torsion on the front axle. Last year the Sunbeam racing cars were equipped with a three-piece built-up axle, the center portion between the spring seats being of I-section, and the two end portions of circular section. The successful Fiat racing cars had a two-piece circular section axle, hollowed out for lightness and evidently bent after having been drilled. This costly construction proved ideal for racing purposes.

Axle Ends Strengthened

There appears to be some tendency toward the use of circular section front axles when front-wheel brakes are employed. An example is the 12-hp. Talbot-Darracq, just about to make its appearance, which is I-section between the spring pads and circular from the spring pads outward. The new six-cylinder Fiat on which the hydraulic servo mechanism is employed, has a special axle of half-moon section between the spring pads, the hollow being made use of to carry the brake camshafts, and a circular section from the spring pads to the steering head. This is one of the best examples of axles designed to resist torsional stresses.

On practically all other makes an I-section axle is employed, with very considerable stiffening of the webs, as shown in Fig. 19. It is the practice to make the front springs somewhat stiffer than normally employed, to use a center bolt, as shown in Fig. 20, and to combine a stop with the hanger at the rear end so that the axle is prevented from moving backward in case of a breakage of the main leaf ahead of the clips.

Servo mechanisms, or devices to make use of the momen-



11—*Amilcar.* 12—*Front wheel brakes on Fiat racing car.* 23—*Excelsior, with brake camshaft on axle.* 24—*Omega Six with aluminum dirt covers over the universal joints held in position by spring.* 25—*Berliet with brake camshaft on axle.* 26—*Fiat Six. Front axle has circular section from spring pads to knuckle.* 27—*Isotta-Fraschini.* 28—*Sizaire-Berwick.* 29—*Peugeot with fully enclosed universal.*

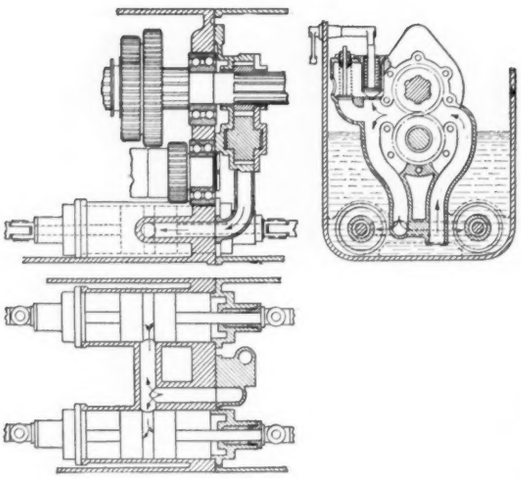


Fig. 21—Diagram of hydraulic servo mechanism used in gearbox of new 30-hp. Fiat six

tum of the car to arrest its progress, have been used on a large number of road racing cars, including Ballot, Fiat and Sunbeam, and are considered by the drivers of these machines to be indispensable. On standard models, however, the application is limited, although on a growing scale. As an example of the reduction obtained without a servo mechanism, the following figures relating to a very successful application of the Perrot system to the 20-hp. Minerva car, may be of interest. The front drums have a diameter of 15.7 in. and the rear pair 18.6 in. with a width in each case of 2.2 in. The four brakes are applied simultaneously by pedal, the reduction being 21.81 for the front and 31.34 for the rear.

Engineer Birkigt of the Hispano-Suiza company was the first to apply a servo mechanism to a stock car, and his device is still in use and giving satisfaction on all cars produced by his firm. A modification of this type was used on last year's Sunbeam racing cars.

The Hallot servo-brake, which also has the advantage of making it impossible to lock the wheels, is in regular use on Bignan, Georges Irat and Chenard-Walcker cars. While the basic principle of the servo-mechanism is the same on all types, the Hallot is distinctive by reason of a servo drum running free having within a positively driven star member carrying a number of centrifugal weights, normally kept in contact with the free drum by coil springs. The centrifugal force exerted by the weights on the free drum increases, of course, as the square of the speed. The brake automatically ceases to operate as soon as the road wheels are on the point of being locked. The Hallot system, therefore, removes all the dangers and inconveniences incident to locking the road wheels.

Fiat Adopts Hydraulic Servo-Brake

On its latest six-cylinder model the Fiat company has adopted a hydraulic servo-brake designed to proportion the braking effort to the speed of the car and to automatically compensate the brakes. Mounted in the base of the gearbox, and using the oil provided for the gears, the Fiat system has the advantage of making it practically impossible to lock the front wheels, and it does not interfere with the mechanical application of the brakes if the vehicle is

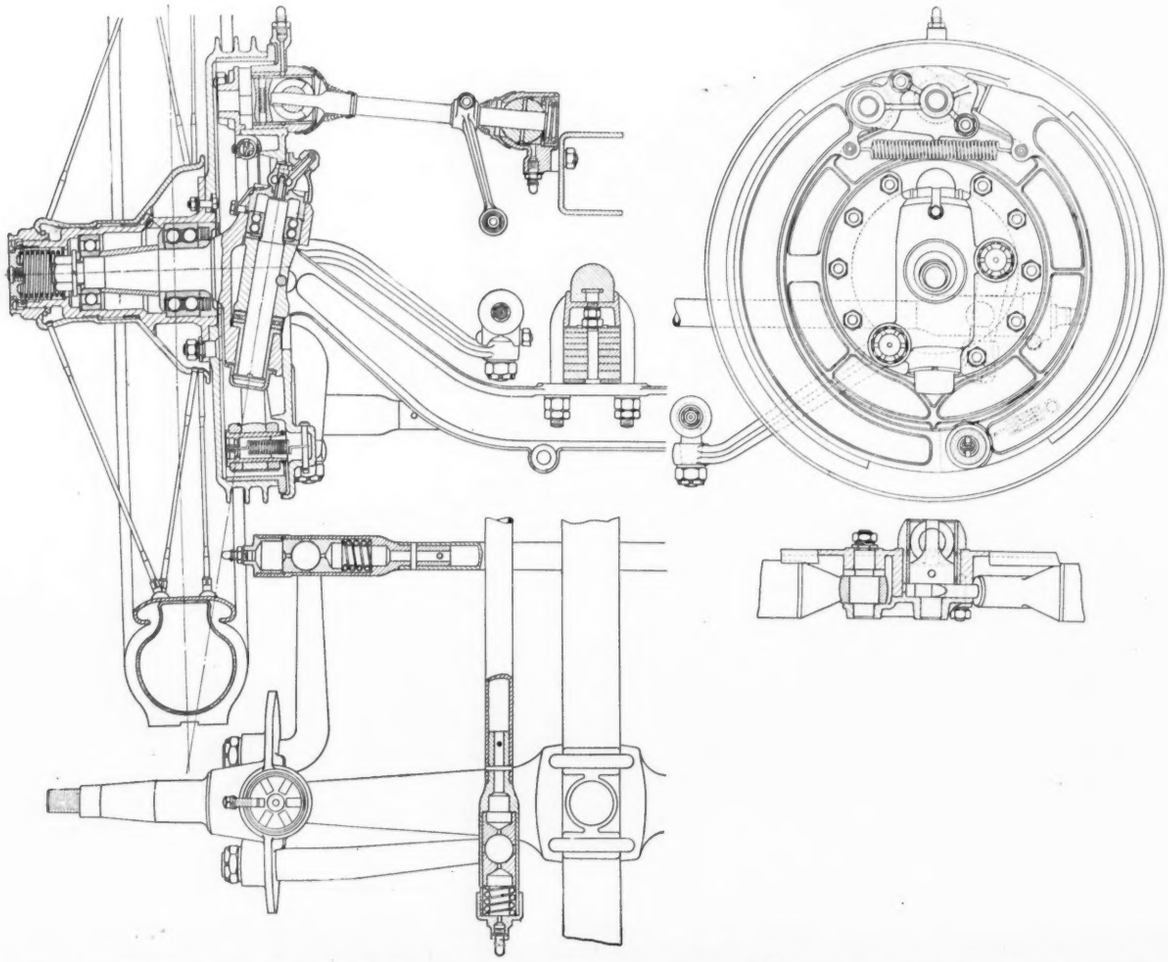


Fig. 22—Minerva front wheel brake and axle. The servo mechanism is said to reduce the danger of locking the front wheel brakes

at a standstill or if, by reason of neglect to maintain oil in the gearbox, the hydraulic pump becomes inoperative.

As shown in Fig. 21, oil is drawn from the bottom of the gearcase by the gear pump which is positively driven from the upper shaft of the gear-set. The oil is discharged into an overflow chamber through the conical valve which in the cut is shown in its open position. From this chamber the oil overflows back into the gearcase and there is merely oil circulation with practically no resistance and, consequently, no pressure in the brake cylinders which are at the bottom of the gearcase.

When the valve referred to is closed through the lever (operated by the brake pedal or brake lever) which is connected to it, the oil pressure on the discharge side of the pump forces oil into the cylinders and displaces the pistons, of which there are two in each cylinder. This results in applying the brakes on all four wheels with equal pressure regardless of the adjustment or degree of play in operating the mechanism between pedal and drum. The braking effort diminishes as the speed of the car decreases and the car is finally brought to a stop and held by the mechanical means.

The simplified type of servo mechanism already referred to in connection with the Minerva (see Fig. 22), and first used on the six-cylinder Farman, is gaining in popularity. This was applied originally to the rear wheels, but the latest practice is to use it on the front wheels only, employing the usual method of two shoes with two separate pivots in the rear wheel drums. In addition to low weight and simplicity, the advantage of this device, which forms part of the Perrot patents, is that the danger of locking the front wheels is very considerably reduced, and the full efficiency of the rear wheel brakes when running backward is maintained. Farman, Minerva, and Talbot-Darracq have this device in regular use, while those experimenting with it are De Dion Bouton and Delaunay-Belleville.

Farman Has Novel Racing Sedan

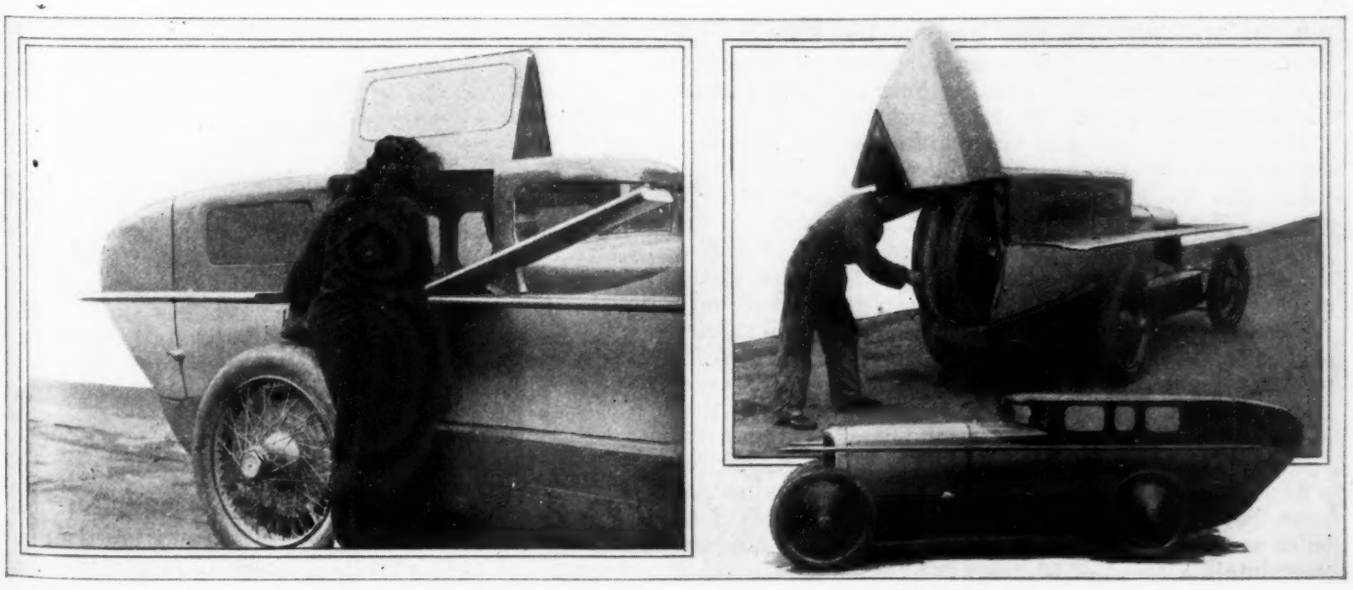
TWO original cars have been produced by the Farman Automobile Company with a view to figuring in short distance speed contest, hill climbs and other competitions in France. While the chassis are identical, one is equipped with a two-passenger open body and the other with a four-passenger sedan, particular attention being paid to streamlining in each case. The design has been worked out by the Farman aviation engineers and the construction of the body is practically identical with that of Farman passenger carrying airplanes. This construction has made it possible to keep the weight down to 3140 lb. for the sedan on a chassis equipped with a six-cylinder engine developing more than 200 hp. on the bench, thus giving a ratio of only 15 lb. per hp.

The engines used on these cars are six-cylinder models of 3.9 by 5.5 in. bore and stroke, with the cylinders cast from Alpax, a 13 per cent silicium-aluminum alloy having a density of 2.65. Cast iron sleeves are used in the cylinder blocks and separate seatings are provided for the three valves (two exhausts and one intake) mounted in the Alpax cylinder head. Clutch and transmission, including gearbox, follow normal lines.

To get the best streamline effect, the main frame members are swept in at the rear, following the contour of the body. Full cantilever springs are used at the rear, and are attached entirely behind the axle, the front end of the spring having a trunnion attachment to the axle and the rear end being attached to the extremity of the frame member. The Adex stabilizer, a Belgian device to eliminate lateral displacement of the rear axle, is employed. Spare wheels are carried in the tail, and battery, tool kit, etc., are housed between the frame members back of the axle.

The main frame members and the whole of the under portion of the car are inclosed to secure perfect streamlining. Only the brake drums and the two extremities of the front axle are exposed. Aluminum is used throughout in the construction of the body, a carcass being formed of duralumin ribs, to which the sheet metal panels are riveted. Height from the ground to the top of the sedan is 5 ft. 2 in. To gain admission a portion of the flat mudguard is hinged and one-half of the roof is raised.

Although the size of the engine puts this car in the open class, and allows of it being run only in short distance events and hill climbs, particular interest attaches to the attempt to secure perfect streamlining by inclosing the driver in view of the fact that some of the 122-inch cars for the French Grand Prix will be treated this way.



Three views of the Farman racing sedan with true streamline body

Operating Experiences Indicate Scope of Rail Car Market

Forty roads listed as using rail car equipment. Running costs vary widely, but are less than with steam trains on short line hauls. Increased use of motor vehicles in this field seems probable. Recent N. A. C. C. report gives practical data.

RAIL car development has been rapid in the last few years. Progress in design has been steady, while experimental operation has given additional data upon which to work. Selling information has grown less rapidly. The market for these vehicles opens a new field for the truck industry. How and where to sell rail cars is known in a general way, but not much specific information has been available.

A report recently made by the Motor Truck Division of the N. A. C. C. to the Interstate Commerce Commission furnishes some very interesting and practical data along this line. Names of forty railroads are listed as now using rail car equipment, and the practical experience of many of these roads is given. These experiences constitute important merchandising data for rail car builders. Some of the more important are presented here as aids to future sales plans.

The **Carrollton & Northville Railroad Company** of Kentucky is operating on a strip of road ten miles long gasoline motor buses in place of steam locomotives. The operation of one of these cars for one round trip costs $2, which includes repairs, labor, gas, oils and depreciation. The same trip with a steam locomotive costs from $15 to $18.

The **Pittsburgh & Shawmut R.R.** operates 103 miles of line serving an important mining region in western Pennsylvania and connecting with the Buffalo, Rochester & Pittsburgh Ry., the Pittsburgh, Shawmut & Northern R.R., the Erie R.R., the New York Central R.R. and the Pennsylvania system. Passenger service is therefore purely local in character and has been conducted as an accommodation rather than a source of revenue.

Until recently the road has maintained but two locomotives and nine cars in passenger service. It is anticipated that the introduction of motor rail cars will enable the Pittsburgh & Shawmut R.R. to expand and improve the character of its local passenger service and at the same time to reduce the cost of this service to the extent that it may become a valuable source of revenue.

The first rail cars have recently been placed in service on the Michigan division of the **C. C. C. & St. L. R.R.**, where a series of demonstration runs were arranged. On these trips the car has been run from Wabash to Elkhart, Ind., and return, a distance of 146 miles at an average speed of 31.2 miles per hour. The car is geared for a normal speed on straight, level track of 37 miles per hour, but has actually been operated at a speed of 48 miles per hour. On a 1 per cent grade the car is designed to maintain a speed of 30 miles per hour and on steeper grades, up to the adhesive limit of the wheels, the car can be operated at proportionately lower speeds.

The fuel consumption on these trips has averaged less than 0.19 gal. of gasoline per mile and a quart of lubricating oil has been found sufficient for the trip of 146 miles, although the equipment was all new and consequently stiff. It has anticipated that the operation of this car will prove even more economical after it has been more thoroughly run in. Each succeeding trip has enabled the operators to improve its showing in one phase or another, particularly with respect to acceleration.

Acceleration a Favorable Factor

In an acceleration test made by one of the visiting railway officials, the car developed a speed of 25 miles per hour in 30 seconds from a standing start. A speed of 29 m.p.h. was developed in one minute, a speed of 35 m.p.h. in two minutes and a speed of 41 m.p.h. was reached in two minutes and 40 seconds from the standing start.

Population on the **Westfield R.R.** is about 175 per mile of line and the road is 33 miles in length. Following is a statement showing the results of operating a motor rail car on this railroad during the months of March, April and May, 1920. This shows that the actual cost of operating this equipment was about 10 cents per mile, so that there was a small profit from operation, although receipts were only 20 cents per train mile.

Three Months, 1920

	March	April	May
Total miles	3,987	3,960	4,092
Passengers carried	4,249	3,721	2,780
Gross revenue	$1,215.82	$1,146.44	$844.40
Gallons of gas	677	599	620
Cost of gas	$169.25	$144.76	$168.00
Cost of oil, grease and coal	11.16	18.53	15.00
Operating labor	260.00	207.80	183.68
Maintenance labor and parts	16.35	7.30	13.20
Total expense	$461.71	$378.39	$379.88
Net cash earnings	754.11	768.05	464.52

Summary

	March	April	May
Gross earnings per mile	.305	.289	.206
Cost of operation per mile	.115	.095	.092
Net earnings per mile	.190	.194	.114
Days operated	31	30	31

Ordinarily the operation of this equipment costs about 12 cents per mile in branch line service, but in main line service where higher wages are paid, it is believed that the cost would average 15 to 20 cents per train mile as compared with an average cost of $1 per train mile for steam locomotive and two-car passenger train.

The **Gilmore & Pittsburgh R.R.** has placed one gasoline car in service. This car has space for the accommodation of baggage and seats 17 passengers. This road is a subsidiary of the Northern Pacific Ry. and runs from Armstead, Mont., to Gilmore and Salmon, Idaho, a total distance of 100 miles.

Grades encountered on the Gilmore & Pittsburgh are very severe, the steepest grade between Leadmore and Gilmore being 6 per cent. On the first trip over this road the rail car successfully negotiated these grades. Between Armstead and Salmon it ascended a 3 per cent grade in high speed with the exception of a short distance which was taken on third speed.

The **Narragansett Pier R.R.** affords another instance where the operation of a gasoline rail car has proved an effective means of stimulating passenger traffic and curtailing operating costs. This road connects with the N. Y., N. H. & H. R.R. at Kingston, R. I., and runs through Peacedale and Wakefield, R. I., to Narragansett Pier, a popular New England resort during the summer months. The Narragansett Pier R.R. is 8 miles long and is not only paralleled by automobile roads, but until recently by an electric line which was abandoned in November, 1920. It is stated that the steam road incurred a deficit of $16,000 from operation in 1920.

Rail cars were placed in service on this road on July 9 and have since been operated without any interruption whatever on a frequent schedule between Kingston and Narragansett Pier and on a turn-around run between Peacedale and the Pier.

When the **Pittsburgh & Susquehanna Railway Co.** installed a motor bus on a spur line of railroad between Philipsburg and Ramey, Pa., it did so with the sole idea of accommodating the people of the two towns, and those living along the line. The fact is, however, that the bus is earning a profit on its operation.

Philipsburg and Ramey are Pennsylvania towns, 14 miles apart. They do not supply enough traffic to justify the service of a passenger train. The only means of transportation, until very recently, was by automobile, which was unsatisfactory, due to the bad road conditions.

The bus is a specially designed 28-passenger body mounted on a 2½-ton chassis fitted with demountable steel railway rims on the rear wheels, and the front axle and wheels replaced with a four-wheel pony truck which follows the curb.

The bus makes four round trips per day, running on a regular railroad schedule, with twelve regular stops.

The railroad's report of the first 52 days of operation of the bus shows 6032 miles traveled, gross revenue of $2,120.95, total expense of $1,522.66 and net earnings of $598.29 or 9.9 cents per mile.

During 1917 the **Atlantic & Western,** at Sanford, N. C., running from that point to Lilington of the same State, began to apply motor trucks to its traffic problems. Perhaps the most significant phase of the A. & W. experience has been found, not in its more economical costs of operation with a railway motor car, but in its charts of increasing passenger traffic. For it is shown that after the introduction of a regular service, at more frequent intervals than was possible with the ancient steam equipment of the line, passenger revenues immediately began to increase to the tune of $535 per month.

On the first of this year the **Lewisburg, Milton and Watsontown Passenger Railway Company** placed in operation a combination passenger and baggage gasoline railcar. This car, which is mounted on a motor truck chassis, was delivered on its own wheels over the lines of the Pennsylvania R.R. from Philadelphia to Milton, Pa., a distance of 167½ miles. Since that time the car has been driven through the worst snow storm ever experienced in the operation of this line between Montandon and Mifflinburg, and at one stage of the operation the car pushed its way in low gear through about 1000 ft. of snow 2 ft. deep.

Short Line Railroads Using Motor Buses With Flanged Wheel Equipment

Name of Railroad	State	Distance
Atchison & Topeka R. R.		
Aberdeen & Rockfish	North Carolina	60 miles
Anaconda Copper Mining Co.	Montana	
Atlantic & Western	North Carolina	25 "
Baltimore & Ohio	Maryland	
Canadian National Railways	Canada	
Carrollton & Worthville	Kentucky	10 "
Central West Virginia & Southern	West Virginia	32 "
Chesapeake Western	Virginia	41 "
Chicago, Burlington & Quincy R. R.		
Cleveland, Cincinnati, Chicago & St. Louis	Indiana	10 "
Fonda, Johnstown & Gloversville R. R.	New York	10 "
Gilmore & Pittsburgh	Montana	100 "
Great Northern	Oregon	35 "
Greenbriar & Eastern	West Virginia	10 "
Hetch Hetchy	California	69 "
Kanawha Glen Jean & Western	West Virginia	14 "
Leavenworth & Topeka R. R.	Kansas	46 "
Lewisburg, Milton & Watsontown Ry.	Pennsylvania	
Mississippi River & Bonne Terre R. R.	Missouri	64 "
Mt. Hood	Oregon	22 "
Morristown & Erie	New Jersey	10 "
Narragansett Pier	Rhode Island	8 "
Columbia & Nehalem River R. R.	Oregon	35 "
Nevada-California-Oregon	California	170 "
New Mexico Central	New Mexico	116 "
New Orleans & Lower Coast	Louisiana	60 "
New York, New Haven & Hartford	Connecticut	104 "
Northern Pacific	Oregon	35 "
Palatina, Lake Zurick & Wauconda	Illinois	16 "
Pittsburgh & Shawmut	Pennsylvania	103 "
Pittsburgh & Susquehanna	Pennsylvania	13 "
Sewell Valley	West Virginia	40 "
Stone Harbor	Virginia	4 "
Tennessee, Alabama & Georgia R. R.		
Tonopah & Gold Field	Nevada	31 "
Union Transportation Company	New Jersey	25 "
Virginia & Truckee	Nevada	31 "
Washington & Old Dominion Railway	Virginia	52 "
Winchester & Western	West Virginia	40 "

Centrifugal Casting Well Adapted to Certain Automotive Work

Process turns out pieces with excellent physical characteristics in wide variety of forms. Production advantages are obtained. Offers large possibilities in manufacture of cast iron parts. Also applicable to aluminum, brass and bronze.

By Louis T. Knocke

CENTRIFUGAL casting has special merit in the manufacture of certain automobile parts. In the production of cast iron pieces particularly, it offers good possibilities, although it is applicable as well in casting aluminum, brass and bronze. This process can produce castings which possess high physical qualities, such as strength, density of structure, uniformity, accuracy of dimensions and general appearance. A variety of forms can be made by this method. The various types include tubes, bushings, disks, rings, gear blanks, spur gears with formed teeth and parts of a flanged-tubular-like shape.

The centrifugal casting process is used by bearing manufacturers, and is known to produce parts free from blowholes and with a dense fine grained structure. This method of casting has a separating effect on babbitt alloys, tending to separate the heavier metals such as copper and lead, and to make them segregate in the outer portions of the casting, while lighter metals, such as antimony, zinc and tin appear near the inner surface. The extent to which this separating action really occurs is slight, however, and can be minimized by employing a low speed of rotation.

THE possibilities of the centrifugal casting process have not yet been thoroughly worked out. This article is designed simply to give some indication of the scope of the process and a general idea of its inherent advantages and limitations. It will be of interest to production men as a commentary on an important item of automotive manufacturing work.

The problems involved in placing a centrifugal process on an economical production basis should offer small difficulty when once they are thoroughly understood. Factors such as speed and temperature of the mold, and molten metal temperatures are definite and controllable to any required degree.

IT is in the production of cast iron parts that this process appears to offer the largest usefulness. Even a well-designed and constructed automobile engine requires regrinding and new pistons and rings after a certain period of operation. The cylinders, barrels, pistons and rings are the shortest lived parts of the engine and whatever can be done to increase their wearing qualities will lengthen the life of the engine correspondingly. Cylinder sleeves, piston rings and piston skirts when cast centrifugally in a metal mold, will possess high wearing qualities. The chilling effect of the metal mold and the pressure to which the molten metal may be subjected result in a dense fine grained structure. A 4-in. piston ring ¼ in. thick, when poured and rotating at 2000 r.p.m., is subjected to an average pressure of 16 lb. per square inch.

IT is possible to produce machineable castings centrifugally without annealing. Annealing is required, however, to relieve the internal strains even before rough machining, so little is accomplished by this procedure.

Many parts used in automobiles require hardened surfaces to resist wear, but are not subjected to stresses approaching their safe capacity. These parts are usually made of low carbon bar steel, rough machined on automatics, then carburized, heat-treated and finished ground. By the time the parts have gone through the necessary operations, their cast becomes high. Among these parts may be mentioned case-hardened steel bushings, thrust washers, hollow rocker arm shafts and both roller and mushroom type of tappets.

Advantages of the centrifugal casting, from a foundry standpoint, are, easily controlled production, uniform quality, low percentage of scrap and clean, accurate castings.

A molder with good pattern equipment can produce daily 2000 bushing type castings. The molds will occupy some 300 sq. ft. of floor space. The cores, although machine made, represent no small item of expense. When cooled the castings are removed from the mold, broken from the gate, cleaned, snagged and rattled. The foundry floor must be cleaned and the sand reconditioned for subsequent use. Risers, gates and scrap castings represent a complete loss as regards the cost of melting and handling.

In contrast to the above method an automatic centrifugal casting machine would occupy about 25 sq. ft. of floor space, and attended by an operator would produce the same number of castings per day. As no sand

or cores are used the usual foundry dust and dirt would be absent.

Expenses chargeable to the centrifugal casting process include the power required to rotate the molds, and the cost of having a supply of molten metal at each machine. The metal can be delivered to the various machines in a molten state, and there maintained at the required temperature by an electric furnace or any other suitable means.

The advantage of centrifugal castings from a machining standpoint are:

1. No sand is fused into the surface of the part.
2. Castings are held to close tolerance, which permits the omission of rough machining operations.
3. Reduction of scrap of semi-machined parts due to the uniformity of shape and the absence of sand holes.

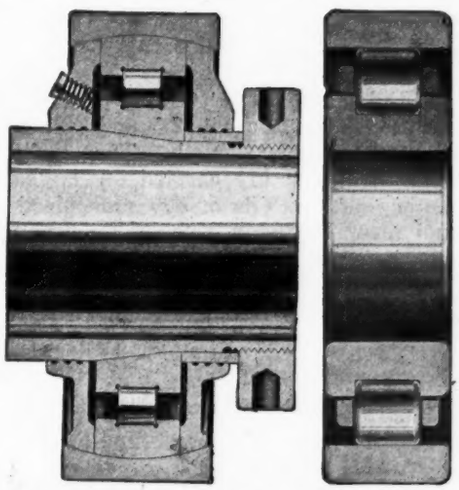
The possibilities of centrifugal castings are being extended to the production of alloy and high carbon steel tubing, also of Monel metal tubing.

If loose pieces, movable pins, and sand cores are used in forming centrifugal castings, a much larger variety becomes possible, but continuous and economical production is sacrificed.

Norma to Manufacture Hoffman Roller Bearings

HOFFMAN roller bearings, known and extensively used in Great Britain and on the Continent for several years, are now to be manufactured and marketed in this country by The Norma Co. of America which has acquired all American rights and business of the Hoffman Co., and is to build a plant especially equipped for manufacturing bearings of this type.

It will be remembered that the Hoffman bearing is of the straight or true cylindrical roller type, rather than of the tapered type, and is thus not intended to take axial thrust loads. Where a thrust load is to be imposed, it is necessary to hold the inner race and rollers in correct relation to the outer race by means of some locating device. For light thrusts a hardened button at the end of the shaft can be employed, but when considerable end thrust is encountered, a locating bearing of standard ball type, mounted between two roller bearings is recommended. The Hoffman bearing, however, is said to have all the speed qualities of the best ball bearing, with a load capacity far beyond that of any ball bearing of equal dimension.



Hoffman roller bearings of the rigidly mounted and self-aligning type

The outer race of the Hoffman bearing is a plain, cylindrical ring of rectangular cross section, the inner surface of which forms a flat line raceway upon which the cylindrical rollers run. The inner race has a channel cross section with narrow flanges either side of the raceway which retains the rollers endwise. The rollers are of true cylindrical form and have a length equal to their diameter. They are held in exact parallelism with the shafts and with one another by the flanges or shoulders which are of hardened steel and allow only slight end clearance for the rollers. The roller case or retainer is of strong and simple balance construction, as will be seen from the accompanying cut.

In addition to the standard Hoffman bearing, already described, which is a rigidly mounted type, a second type, known as the Hoffman self-aligning roller bearing, is also to be manufactured by The Norma Co. In this type the periphery of the outer race and its two covers, designed to exclude dirt and other foreign matter, are ground in such a way as to form a spherical surface. This feature gives the bearing its self-aligning quality. The dust covers are fitted with very small running clearance, in order to prevent the lubricant from working out and dust from working into the bearing surface. The clamping sleeve can be arranged to extend clear through the dust covers, so that the bearing can be mounted without exposing the working parts.

Hoffman bearings are said to have a running friction about one-tenth that of a well fitted plain bearing and a starting friction 1/800 of that of a plain bearing. In addition to its steady load capacity, the bearing is said to be capable of temporary overload and to stand up well under shocks and vibrations.

A particular feature of these bearings emphasized by The Norma Co. is the exceptional accuracy maintained in their manufacture.

Tire Carrier Bracket Has Pressed Steel Parts

A BRACKET designed to fit dummy hubs used for holding spare disk or wire wheels or the spare-tire carrier of the three-arm type, has been placed on the market by The Oakes Co.

The bracket is constructed of pressed steel parts, riveted together with all seams spot welded between rivets. The base is concave in form and drilled for rivets ready to attach to the gasoline tank apron or sheet metal guard. Light weight and great strength are the advantages claimed for this bracket.

Oakes pressed steel tire carrier bracket

Full Tracklayer Type Tractor Added to Bates Line

New product developed for industrial work. Uses Midwest engine having a 4.75 in. bore and 6 in. stroke. Machine weighs 8500 lb. and is said to have a drawbar pull of 6500 lb. Three forward speeds give wide operating range. Minimum road clearance 14 in.

A FULL tracklayer type of tractor intended for industrial work has been placed on the market by the Bates Machine & Tractor Co. This new tractor, known as Model 40, weighs 8500 lb. and is understood to have a maximum drawbar pull of 6500 lb. The minimum ground clearance is 14 in.

The engine is a Midwest with 4.75 in. bore and 6 in. stroke. It is said to develop over 55 hp. at normal speed. A 3-in. crankshaft is used. Pressure lubrication governed by the load placed on the engine is employed. Bosch high-tension magneto and an oil type air cleaner are regular equipment.

Gearset, engine clutch and engine are combined into a unit powerplant. The main frame, which is made of 6-in. channel steel, is attached to the gearset case at the rear end and at the front to a cross member which supports the forward end of the engine.

The crawler frames, also of 6-in. channel steel, are attached through flexible joints to the dead rear axle and to an oscillating bar at the front end. This oscillating bar is attached to a heavy steel cross member in the center of the main frame. The outer ends of the oscillating bar rest on coil springs which carry the front end of the crawler frame. A roller guide, incorporated in the oscillating bar, prevents the crawler frames from swinging sidewise. The front end of either crawler frame has a free vertical movement of 11 in. independent of the other.

Heat treated crucible steel is used for the crawler shoes and hardened bushings and pins are pressed into them. The width of the crawlers is 10 in. and their length on the ground is 7 ft. This gives a total tractive area of 1680 sq. in. and a turning radius of 7 ft.

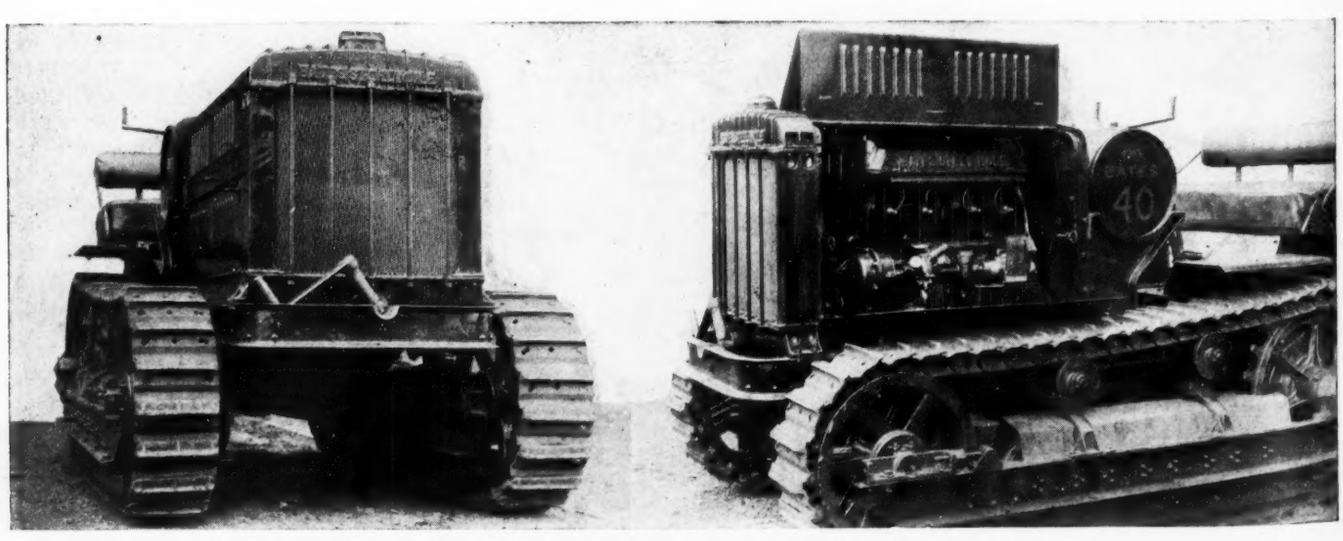
Steering is accomplished by two large multiple disk clutches actuating each driving sprocket. Clutch plates are covered with Raybestos and run in a bath of oil. The steering clutches are located on what would ordinarily be termed the jack or differential shafts, but no differential is employed.

Brake Drums Have V-shaped Grooves

Brake drums have a V-shaped groove turned in their faces and the brake bands are lined with a series of V-shaped bronze blocks. These brakes operate in oil. The steering clutches are operated by a cross bar with vertical handles supported on a rigid steering column. Brakes are controlled by individual pedals which can be locked with a ratchet when necessary.

A sliding gear, selective type gearset is used. The three forward speeds are 1.4, 2.5 and 4.25 m.p.h., and the reverse speed is 3.25 m.p.h. The shafts are all made of nickel steel and are carried on Timken roller bearings. The engine clutch is of dry multiple disk, operated by a hand lever having a ratchet for locking out the clutch when it is not in use.

The final drive gear which is attached to the hub of the driving sprockets, and the final drive pinion which is



Two views of Bates tracklayer type tractor. Oscillating bar permits a deviation of 11 in. vertical movement for each crawler

attached to the end of the steering clutch shaft, are enclosed in a steel case and run in a bath of oil.

The radiator has a cellular core and a heavy cast iron shell which is equipped with a suitable guard. The front end of the main frame is arched and projects about 5 in. forward of the radiator, thus forming a heavy guard for the front end of the tractor.

A large coil spring is incorporated in the front end of the drawbar to take the shock when starting a heavy load. Crawler or truck wheels, as well as the front wheels and the hub of the rear wheels, are of crucible steel. The rear wheels have an outer rim of manganese steel carrying the sprocket teeth. All wheels are mounted on roller bearings protected from dust and running in a bath of oil.

The dash is of ¼-in. boiler plate, while the hood, side shields and sheet metal around the operator's seat are 12-gage terne plate. Fenders and floor plates are 3/16-in. boiler plate, and shields above the crawler wheels are 12-gage terne plate.

The operator's seat is sufficiently wide for two people. The back is upholstered with rubber covered cloth. Standard cushion springs and rubber covered cloth are used for the cushion, which is removable. The length of the tractor is 120 in. and the width and height are both 64 in.

Automotive Trade in the Netherlands Shows Improvement

THE motor vehicle trade in the Netherlands during 1922 showed some improvement over the previous year. During the first part of the summer German cars dominated this market, due to the relatively low prices at which Dutch buyers could purchase them. The German post-war product has never attained a high degree of popularity in the Netherlands. Cheapness in price proved the principal incentive to their purchase during this period. However, the subsequent decline in French and Belgian exchange made a considerable change in the situation. Well known French and Belgian, as well as Italian cars, have always enjoyed a considerable degree of popularity in the Netherlands, and the turn in the exchange market afforded Dutch buyers a favorable opportunity to purchase them at prices with which it has been very difficult for American cars to compete.

Following are the prevailing prices in the Netherlands of some of the continental makes: Fiat, 10/15 hp. 4 cylinder, 4 passenger, 4,200 guilders (the guilder has been around $0.39 for the past six months); A. G. A. (German), 4 passenger, 3,900 guilders; F. N. (Belgian), 4 cylinder, 4 passenger, 4,200 guilders; Delage (French), 11/15 hp., 4 cylinder, 4 to 6 passengers, 5,100 guilders; Citroen, 10 hp., 4 passenger, 2,700 guilders.

American cars have lost none of their popularity in the Netherlands, but the competition from countries of depreciated exchange has made it increasingly difficult to market medium priced American makes. The high price of the British cars continue to be an obstacle to the sale of those makes in this market, and the same is the case with the Dutch Spyker, the price of which is practically out of reach of the buyers in this country.

The accompanying table gives a survey of the Dutch imports of motor vehicles during the years 1920 and 1921, and the first nine months of 1922 as well as the corresponding period in 1921.

Imports of Automotive Vehicles into the Netherlands

	1920	1921	9 mos. 1921	9 mos. 1922
Imports of passenger cars from:				
Germany	2144	1224	717	922
United States	2968	520	416	699
France	235	468	423	157
Belgium	402	286	249	429
Great Britain	207	167	154	...
Italy	67	94	89	...
All others	66	84	60	136
Total imports	6089	2843	2108	2343
Total exports[1]	233	183	143	122
Net import	5856	2660	1965	2221
Imports of motor trucks from:				
Germany	1398	573	349	638
France	63	66	58	29
United States	83	29	23	...
All others	102	60	50	78
Total imports	1646	728	480	745
Total exports[1]	78	66	56	38
Net imports	1568	662	424	707
Passenger car chassis:				
Imports	767	269	205	168
Exports[2]	48	50	31	44
Net imports	719	219	174	124
Motor truck chassis:				
Imports	789	287	213	662
Exports[3]	2	6	6	5
Net imports	787	281	207	657

[1]Principally to Dutch East Indies.
[2]Principally to Belgium and Germany.
[3]Principally to Germany and Dutch East Indies.

Heavy Truck Market Limited

The only American truck which is being sold to any extent in the Netherlands at the present time is a well-known one-ton truck which has become quite popular, and has virtually no competition. The market for heavier trucks is normally quite limited, and at the present time it is practically impossible for American manufacturers to secure any part of it. This is mainly due to the fact that a quantity of new three-ton American trucks, emanating from the A. E. F. war surplus stocks at Coblenz, have found their way into the Netherlands, and are being offered for sale at prices with which it is impossible to compete. These army trucks can be bought at the present time for 3,200 guilders ($1,280), including lamps and equipment.

Six-Stroke Kerosene Engine

A CORRESPONDENT in a German contemporary states that for burning kerosene he has constructed a six-stroke cycle engine in which the kerosene-air charge in the cylinder is at once compressed and expanded without being fired, to give the kerosene a chance to abstract from the cylinder walls sufficient heat to insure its vaporization. One good feature of this principle of operation in the case of a two-cylinder vertical engine is that the cranks can be set at 180 deg. for the best balance and yet the explosions come at equal intervals of 540 deg.

Careful Inspection Characterizes Quality Body Building

Factory man checks lumber at point of shipment. Imperfections are caught as early as possible in production process. Seven hours are required for the finish hand filing work on Packard closed cars. Sand-blast used in preparing bodies for painting.

By J. Edward Schipper

A GOOD example of high-price body work on a car of fairly large production schedule is provided in the manufacture of closed units for the Packard Single Six chassis. Supervision of the body work on this car begins in the forest. Men are stationed in the field and examine the lumber at the point of shipment. While the lumber for bodies is shipped under the rules of the National Hard Wood Association, these rules do not cover toughness, but merely knots, worm holes, and natural defects. The wood is selected in accordance with more rigid standards, so that the structural strength is also taken into consideration in picking it out.

The lumber is graded again at the saw in the body plant before it goes into stock and after the mill work. Consequently very little reaches the shapes that is not of the best possible quality. Great stress is put on the work of the layout man in the high price body shop. His ability to judge the characteristics of a piece of wood makes it possible to secure the best joints and to get the most out of a given piece. He must know, for instance, just what spring in the saw a certain type of wood is likely to cause and how to allow for it.

As far as the actual wood working operations are concerned, the processes are the same as in any body shop. Pieces from the shapers are brought together in sub-assemblies, such as the doors, roof, and back frame, etc. Final assembly of the Packard closed body is in a massive jig or buck with complete checking points to insure exact uniformity. The jig is equipped with template pieces with which the fender fits can be checked so that there is no need for hand fitting afterward.

Finishing Off the Wood Foundation

After the body is completely framed in the jig, men equipped with draw shaves, wood files and scrapers go over it. This is an operation not found in the lower priced bodies. The object is to put the wood foundation in such condition that the metal sheathing will conform to the wood at every point, and hence eliminate the possibility for drumming caused by vibration set up in an area of unsupported metal. Workmen for this job are specially selected because they must be careful to at no time go below the proper contour. Chisels are kept away from them except under exceptional conditions, so that the possibilities of damaging a body that has gone this far in production are slight.

The application of the metal to the frame is similar to that found in any body shop. After the metal is on, however, the care exercised in going over the bodies to put the metal surface into perfect condition is unusual. In fact, it costs about as much to prepare the surface on one of the Packard closed bodies as it does to perform the majority of operations in manufacturing an entire low-priced job.

The time required for finish hand filing averages about seven hours per closed body. An entire department covering a large area is devoted to nothing but this work. Operators go over the body surfaces with feeler mits to locate ripples, high spots and depressions. Floor inspectors check every body before it is finally passed. Every defect these inspectors find is ringed in chalk and gone over again until it is satisfactory.

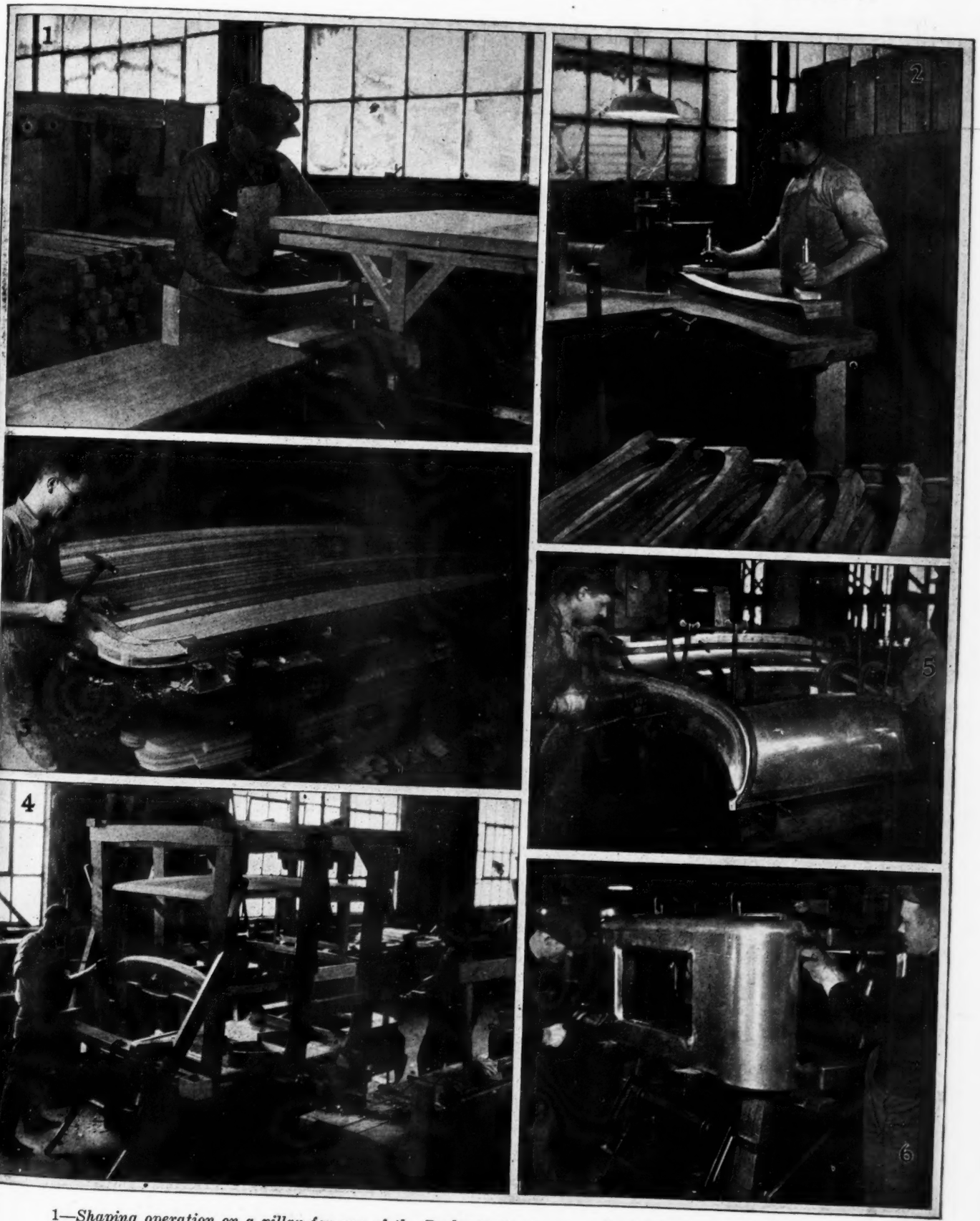
Elimination of Surface Depressions

The imperfections found by workmen and inspectors in the surface of the sheet metal after it has been applied to the wood frame are for the most part of a minor nature. They are invisible to the eye and in many cases cannot even be detected by the naked hand. When the feeling mit is used, however, a trained workman can detect depressions and minor inequalities of the surface that would show up on a highly polished surface. These are apparently on a painted body by light refraction and reflection rather than by direct visibility. Such conditions would be sufficient to cause the rejection of the finished paint job. Therefore, even though it is laborious and expensive to put seven hours per body into finishing before painting, it would be still more costly to have these bodies rejected at the rigid, final inspection.

Another operation used in the preparation of the bodies for the paint shop, which would be out of the question with low-price production, is sandblasting. In the case of the Packard body it is estimated that the cost is 75 per cent more than the usual steam and hot water wash method. The sandblast is operated under from 40 to 50 lb. per sq. in. pressure. This is sufficient to cut the dirt but not to roughen the surface. The bodies leave the sandblast in a condition ideal for receiving the paint.

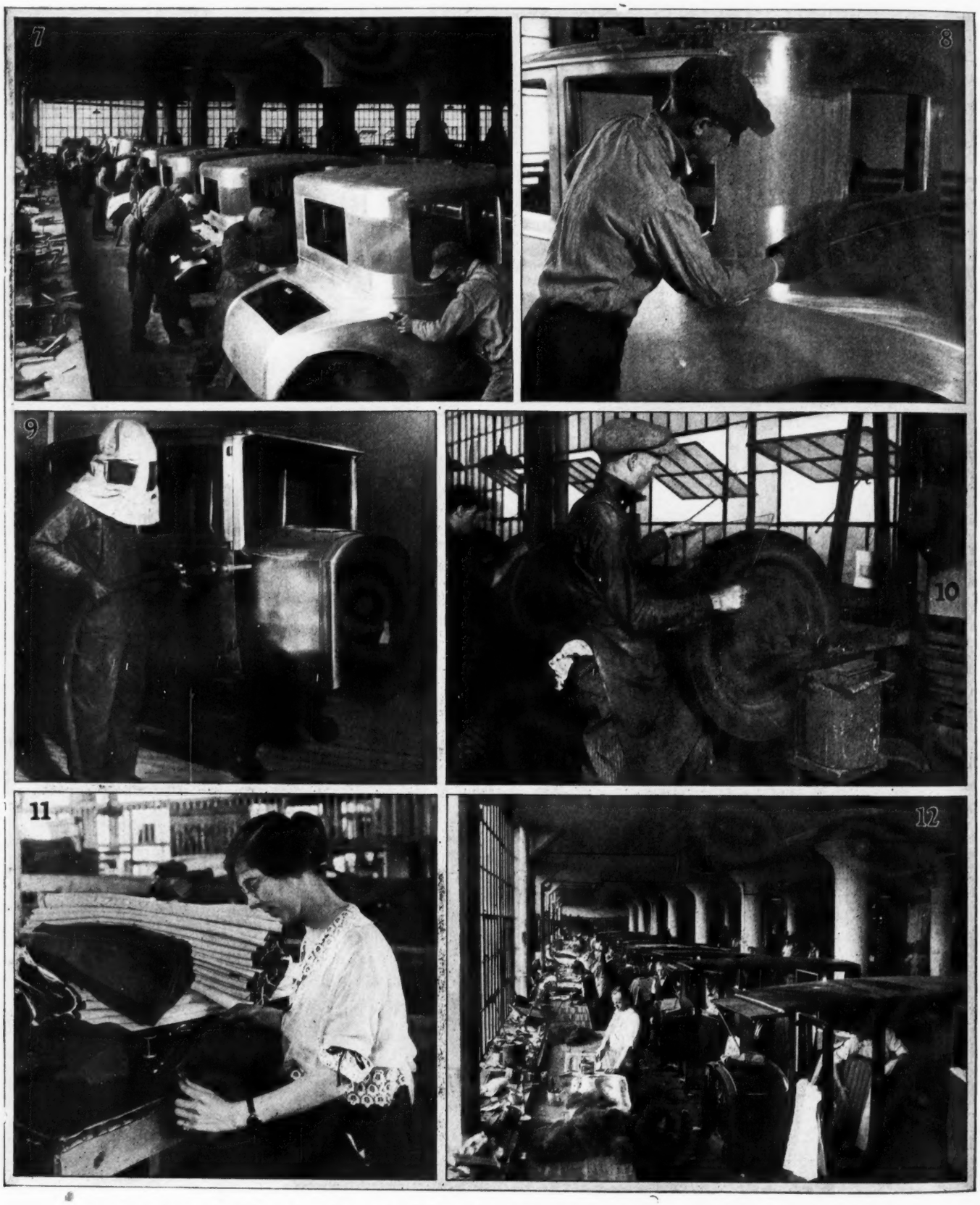
Although a description of the operations in the trim and upholstery departments would read the same as for a shop in which quality was subdued to some extent for quantity, there is a marked difference in the rigidity of inspection. Quality of stitching on cloth and leather, matching of stripes on upholstery, and the quality of joints and finish are all looked after to the last detail. The best quality of curled hair is used and a waterproof, vulcanized compo-

Packard Single Six Bodies in Process of Construction



1—Shaping operation on a pillar for one of the Packard closed cars. 2—Typical jig used in the wood shaping operation. 3—Framing the roof of a Packard coupe in a roof fixture. 4—Complete framing jig used for Packard coupe. Note template for windshield, fender fitting pieces, etc. 5—Fitting the metal sheathing to the wood body frame work. 6—Fitting metal to the corners of windows on wood frame

Inspection and Finishing of Packard Single Six Bodies



7—Preliminary finishing of surface with files and emery. 8—***Inspecting metal surface with feeler mit.*** *9—Sandblasting at low pressure to thoroughly clear body before painting operation.* 10—***Repolishing glass*** *for windows of closed bodies at points where surface defects are noted.* 11—*Inspecting stitching in upholstery for Packard closed cars.* 12—*Enclosed car trim line where the upholstery is applied. Note floor insp ctor*

board takes the place of the commonly used pasteboard for linings. Exceptional care is used in the selection and workmanship on the garnish moldings, and the glass employed is of the best grade. Incidentally, glass for the Packard closed cars is being purchased in Belgium at present because of the shortage of the highest grades of glass in this country.

The floor rugs are all lined. This greatly increased the durability of the rug and causes it to lie flatly. The rug is cemented to heavy duck with rubber cement. A rug lined in the same manner is placed in the compartment under the rear deck of the coupe. Another little touch which indicates the attention paid to detail in body furnishings is the use of rubber tubing for windlace around the doors and windows in place of the usual cord.

The painting schedule for the Packard closed cars covers twenty-eight days on the average. This is from four to six times as long as required for medium-priced cars. The paint is dried under controlled conditions as regards temperature and humidity. These two factors are automatically controlled. This makes it possible to have absolutely uniform drying conditions at all times of the year. Automatic control is used in every coat where there is any question of drying in the specified time. With glazing putty, spot putty and all coats specifying air drying there is no question but that the coats will be as dry as if under controlled conditions.

A few of the conditions applying to the handling of these bodies through the paint shop were outlined in an article in AUTOMOTIVE INDUSTRIES for March 30, 1922, on the equipment of Drying Systems, Inc. The actual operations are familiar, but the schedule itself is unusually complete.

Inspection precautions are taken to catch imperfections just as early as possible. A good example of this is the placing of the lumber inspector at the point of shipment of the raw material. This avoids, as far as possible, the shipment of any but desirable lumber. Close inspection takes place before and after lumber leaves the rough mill operations.

All pieces are carefully inspected after they leave the shapers. Jigs and templates are used to check the subassemblies for the frame. Inspection operations on the finishing of sheet metal work have been described. Before the bodies are passed along the trim line they are inspected for details in the paint operations, and any refinishing that has to be done is caught as early as possible. Upholstery work is checked by both body shop and complete car inspectors before it starts along the final body assembly line. At the end of the final body assembly line there are a body shop inspector and an inspector who is responsible only to the management of the Packard Motor Car Co. The latter examines each body and his acceptance ends the responsibility of the body shop for the unit.

PAINT SCHEDULE FOR PACKARD CLOSED CARS

Operations	Time	Drying condition
Prime	12 hr.	Controlled condition*
Half and half	12 hr.	Controlled condition
Glazing putty	Over night	Air dry
Spot putty	Over night	Air dry
Rough stuff (4 coats)	5 hr.	Controlled condition
Rub	Over night	Air dry
Preparation coat	Over night	Air dry
1st color	6-8 hr.	Air dry
1st color varnish	12 hr.	Controlled condition
2nd color varnish	36 hr.	Air dry
Rub	Over night	Air dry
3rd color varnish	12 hr.	Controlled condition
Trim	3 days	Air dry
Rub	Over night	Air dry
Finish	3 days	Air dry

Nelson Piston Designed to Avoid Distortion

A NEW type of piston which is said to have undergone successfully unusually severe tests on certain passenger cars, is that designed by A. L. Nelson and illustrated in the accompanying cut. It is said that this type of piston can be fitted much closer than ordinary cast iron pistons with absolute safety.

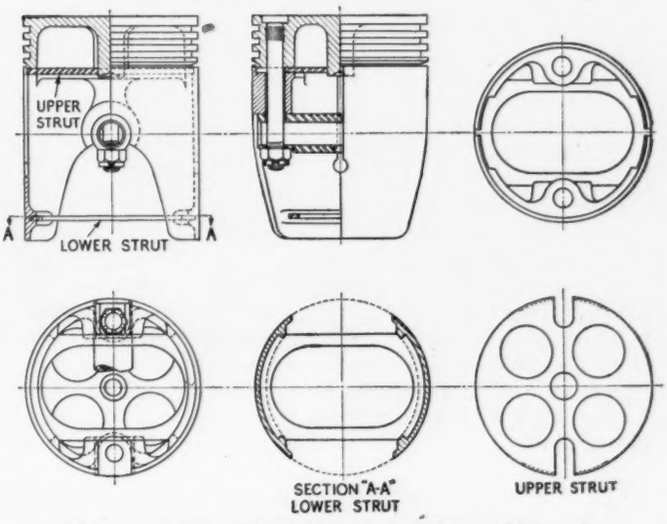
One object of the construction employed is to keep the piston absolutely round. To this end the piston head is cast separately and is fastened to the skirt by bolts which pass through bosses cast on the inside of the skirt and then through the wrist pin.

The piston head is cast from aluminum alloy or gray iron, as desired, while the skirt is made of aluminum alloy. Into the skirt are cast two steel stampings, termed struts. The upper one of these is pressed in place while the lower is cast in place. The upper strut is clamped between the skirt and the head, the latter being centered by an integral pilot which fits through the central hole of the upper strut. Both struts are in place when the skirt is finished to size.

The upper strut is relieved 1/32 in. on each side over that part of the strut adjacent to the diameter, which is parallel to the axis of the piston pin. The piston pin is hardened and ground and made a free fit in the piston.

The expansion of the piston head, with this construction, is independent of that of the skirt, the latter being partly insulated by the intervening upper strut. The struts are intended to maintain a true cylindrical surface on the piston, and thus to effectually prevent piston slap.

The weight of the piston is said to be 52 to 60 per cent of the weight of the ordinary cast iron piston. It is admitted that the pistons are higher in first cost than some other types, but since they are claimed to do away with piston slap and cylinder scoring, the advantages are said to more than offset the added first cost.



Nelson piston with head separate from skirt and inserted steel struts

Army Develops Highway Transport Plan for Emergencies

Program evolved from experience in France. Would handle transportation problem on national scale in event of railroad tie-up. Railway, waterway and motor truck services would be coordinated. Centralized control system urged for commercial trucking.

REALIZING what a severe calamity would overtake the nation if the transportation facilities of the country were tied up through strikes or internal disorders of any nature, the United States Army has developed a plan to coordinate all the available transportation and mitigate thereby the industrial stagnation and hardship to the people of the country who would otherwise be deprived of the necessities of life.

The War Department undertook the development of a highway transport plan when the railroad strike loomed on the horizon last year and threatened serious results. It was the belief of the Department that the Army was best fitted to undertake this work because of its experience in France which developed a corps of highly trained highway transport engineers.

Major B. Taylor of the Quartermaster Corps, U. S. Army recently outlined the plan of coordinated highway transportation before the Society of Automotive Engineers at Washington, D. C. He showed by reference to experience in France and the final plan as developed there, just what method the Army has ready to combat the tying up of rail transportation in this country. Its application is shown graphically in the accompanying map.

Experience in France showed that the decentralized system of trucking was incapable of handling the transportation problem. Realization of this fact gave rise to a centralized system which began in a small way by the formation of a truck train and gradually grew into a unified system which controlled the entire Service of Supply for the Army. The method of operation is described by Major Taylor as follows:

"The Advance Section was divided into four large motor transport areas and motor transport centers were established at important points and rail-heads just as they are shown in this map of a section of the United States. As part of our highway transport service we organized and operated seven minor repair parks, like big service stations in this country, two very large automotive warehouse depots and seven major repair establishments. These latter were extensive affairs, composed of machine and blacksmith shops, carpenter and upholstery shops, chassis and body shops, warehouses and power plants and all the stationary machinery required to overhaul trucks and automobiles in a program of quantity production.

"IN addition there were railroad sidings, warehouses, gas and oil stations, barracks and living quarters and large areas prepared for parking vehicles. The largest of these repair establishments covered areas of 60 to 70 acres and were operated by repair personnel of 1200 to 2000 officers and men, most of them from the big automobile factories—Detroit and similar automobile manufacturing towns. We were preparing to maintain about 100,000 motor vehicles in our shops besides the ones we operated ourselves. We did make 50,000 repairs and over during the first year of our business."

Development of traffic control is a vital factor in the field of highway transport. Major Taylor's description of the methods followed in France well illustrate the matter.

"This traffic control section was composed of a map room, a traffic squad equipped with motorcycles or light, fast cars, a dispatcher's desk with telephone connections to garages, rail-heads, important headquarters and traffic control posts established all over the section. We not only sent out cars, trucks and truck trains from our own garages, equipped with proper road maps, routings and transportation orders, but we kept control over them while on the road. This section maintained vehicle records and issued shipping orders which corresponded to waybills.

"THE motor transport officer of a truck train, like a railroad conductor when operating in the rear, stopped his train when he passed one of these control posts and reported by telephone to the Chief Dispatcher. "In this way he might receive a change of orders, new orders or orders regarding return loads. Many other matters pertaining to traffic control were handled by this section which became the very spirit of transportation.

"Truck trains of new organizations passing through our area often became lost or jammed. Green officers and drivers who had only recently drawn their vehicle equipment would completely block a small town or road with a truck train they didn't know how to handle. Someone would telephone to our well known traffic control section and one or two young experts in what we called our "convoy service," that is handling a fleet of trucks or a truck train on the road, would, if necessary, be started out any time of day or night and soon have the strangers straightened out and on their way. Through this section we learned of stranded organizations or stalled supplies urgently needed in the battle lines. The whole motor transport service would hear of it and become keen to organize extra truck trains to move such passengers and freight up where they were needed.

"These youngsters in the traffic control section mapped

Map Showing Army Highway Transport Pla

Map Showing Army Highway Transport Plan Applied to Section of Middle West

Railroads
Convoy Routes and Numbers
Gasoline Tank Station and Capacity (1,000 gals.)
Garage
Repair Shop
Service Station
Motor Transport Center, Administrative Office
Railroad Yard and Terminal
Limit of M.T. Center Delivery Service
Area of M.T. Center Convoy Service (Shaded portion)
Motor Transport Convoy Terminal
LAKE ERIE
LAKE MICHIGAN
BUFFALO, N.Y.
DETROIT
CHICAGO
TOLEDO
CLEVELAND
PITTSBURG
BALTIMORE
NEWPORT NEWS, VA.
TO CHATTANOOGA AND MEMPHIS-TENN.
TO SAVANNAH-GA.
TO MOBILE, ALA.
TO NEW ORLEANS
TO MEMPHIS
TO ST. LOUIS
ST. LOUIS
CINCINNATI
INDIANAPOLIS
COLUMBUS
DAYTON
SPRINGFIELD
LEXINGTON
LOUISVILLE
NASHVILLE
BOWLING GREEN
CRAB ORCHARD
RICHMOND
PARIS
MT. STERLING
MAYSVILLE
PORTSMOUTH
GALLIPOLIS
CHARLESTON
HUNTINGTON
BLUEFIELD
CLARKSBURG
FAIRMONT
GRAFTON
CUMBERLAND, MD.
MARTINSBURG
UNIONTOWN, PA.
STEUBENVILLE
WHEELING
ZANESVILLE
CAMBRIDGE
CANTON
AKRON
YOUNGSTOWN
NEWCASTLE
WARREN
ERIE
ASHTABULA
SANDUSKY
MANSFIELD
MT. VERNON
MARION
LIMA
FINDLAY
TIFFIN
FREMONT
NORWALK
ELYRIA
LORAIN
ERIE PROVING GROUND
PUT-IN-BAY
KENTON
DUNKIRK
OTTAWA
VAN WERT
DECATUR
BUTLER
DEFIANCE
WAUSEON
ANGOLA
ELKHART
GOSHEN
SOUTH BEND
LA PORTE
MICHIGAN CITY
PLYMOUTH
ROCHESTER
WARSAW
WABASH
PERU
KOKOMO
MARION
MUNCIE
GREENVILLE
NEWCASTLE
RICHMOND
ANDERSON
GREENSBURG
SEYMOUR
MADISON
JEFFERSONVILLE
VERSAILLES
GEORGETOWN
FRANKFORT
HILLSBORO
WASHINGTON CT. HOUSE
CHILLICOTHE
ATHENS
POMEROY
PARKERSBURG
WILLIAMSTOWN
MIDDLETOWN
HAMILTON
LEBANON
WILBUR WRIGHT FIELD
FAIRFIELD
SPRINGFIELD
COSHOCTON
NEWARK
LANCASTER
ZANESVILLE
CADIZ
DOVER
WELLSVILLE
ALLIANCE
SALEM
CANTON
AKRON
MANSFIELD
MT. VERNON
MARION
FINDLAY
TIFFIN
FREMONT
NORWALK
ELYRIA
LORAIN
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CANTON
AKRON
YOUNGSTOWN
NEWCASTLE
WARREN
ERIE
ASHTABULA
SANDUSKY
MANSFIELD
MT. VERNON
MARION
LIMA

and posted towns, woods and dangerous or difficult routes when they were not busy handling fleets of trucks. To them the highways were like a big system of rails. They followed the course of truck trains from point to point on the maps and knew at all times how to get hold of a train commander many miles away in a few hours, to change or add to his orders regarding the collection or delivery of emergency shipments."

The lesson learned in France Major Taylor sums up as follows:

"Motor transportation is the chief element of highway transportation. Highway transportation is essentially a short haul service which gives its best results when organized as a centralized service of operating trucks and trains and the repair shops and warehouses necessary to maintain them in effective operation."

Need for a centralized service in the event of transportation difficulties in this country is considered an absolute necessity, because of the extreme distances between centers of production and centers of distribution. Thus the original plan of the automobile industry to replace railroad service by trucks as needed was discouraged by the Army. It was felt that such a replacement proposition would fall down if a railroad strike became at all serious and this idea is based on the Army estimate that trucks could not replace 15 per cent of railroad freight on a tonnage basis if all rail transportation were tied up. This final estimate is based on the railroad revenue ton mileage figure of four hundred and ten billion for the year 1920 as published in the report of the Joint Commission of Agricultural Inquiry, 67th Congress, and the estimate of 1,000,000 motor trucks averaging two tons capacity and 100 miles per day for 305 working days.

The success of any centralized transportation system depends in large measure on highway transport engineers and in this connection Major Taylor said:

"The highway transport engineer is still a new and much doubted individual. There are not many in commercial life. If there were you wouldn't hear so much about 'Ship by Truck' and you would be hearing about 'Ship by Highway Transport.' The automobile industry wouldn't be selling trucks, it would sell fleets of trucks. The railroads wouldn't be talking about taxing the truck operator for use of highways to make competition fairer, they would be the greatest beneficiaries from a highway transport service that radiated from their shops and terminals."

Major Taylor claims that the Army plan which is called a National Motor Transport Service is applicable to commercial trucking in time of peace. He believes that its general adoption as a coordinating plan would save millions of dollars annually and serve as a guide to the solution of local trucking problems. In this connection he said:

"The zenith of development in overland transportation can only be reached by the proper development of a highway transport service with its organized centers at all railroad terminals and stops to 'collect' and 'distribute' railroad passengers and freight."

Major Taylor maintains that highway transportation is too far advanced for any man or group of men to stop its progress. He said:

"We need to speed up highway transportation so as to hasten the coming of cooperative and coordinated transportation, the transportation of our future, which the President emphasized as one of our greatest needs in his recent message to Congress."

Lincoln Highway Is Two-Thirds Finished

IN the nine years ending with the advent of 1923, over $47,000,000 was expended on the improvement of the Lincoln Highway, enough at an average of $20,000 per mile to construct 2350 miles of the route or more than two-thirds of it. The fact is, more than two-thirds of it has been built, if by "built" is meant the completion and opening of a road satisfactory for the traffic of the present.

Each year since the inauguration of the work of the Lincoln Highway Association has seen the construction of between 7 and 10 per cent of the total distance and has witnessed the extension of adequate maintenance over a longer and longer mileage of the completed work. The eleven States traversed by the Lincoln Way built 235 miles of the route with the aid of the Federal Government in 1922, this work costing in total $4,678,041.71, or an average of practically $20,000 per mile. Maintenance during 1922 cost $1,368,126.39, so that the total amount expended on the betterment of the route last year was $6,046,168, an amount slightly less than the average of the past five years.

At the recent annual meeting of the Board of Directors of the Lincoln Highway Association, it was estimated that by the end of this year, taking into consideration the existing contracts, over $50,000,000 will have been expended on the improvement of the Lincoln Highway. It was further estimated that at least $20,000,000 more will necessarily be invested in additional improvement to open up a road for the traffic across each State.

From these estimates it is evident that bringing "the Nation's Main Street" to a satisfactory status of improvement will require a total expenditure of some $70,000,000.

Road Census of Oregon Taken

OREGON now has 23,608 miles of improved road, not including that added during last season, according to the Bureau of Public Roads, United States Department of Agriculture, which has made a complete census in the State. The improved road mileage at the beginning of 1922 was as follows:

Graded and drained	15,559
Gravel, chert, and shale	6,230
Water-bound macadam	840
Bituminous macadam	35
Bituminous concrete	746
Cement concrete	139
Miscellaneous	60

The total road mileage of the State is 45,475 miles, as compared with 36,819 miles in 1914, and during the seven-year period from 1914 the graded and drained mileage has increased from 4719 to 15,559, and the surfaced and paved roads from 4726 to 8050 miles.

The total revenue in 1921 amounted to $28,532,824, or $298 for each square mile of area, $627 for each mile of road, or $36.42 per capita.

Are Cores With Indirect Radiating Surface as Effective as All-Direct Types?

One maker contends that decreased resistance to passage of air in certain fin types offsets lower heat dissipating ability.

Editor AUTOMOTIVE INDUSTRIES:

It is notable that in most published discussions concerning automobile radiators there is still a good deal of vagueness in regard to whether the fin type is superior to the type in which all the water is in contact with the cooling surface, or vice versa, but it seems to me that there is every reason why a radiator embodying properly designed fins should be as effective as one having none. The temperature gradient entailed in getting the heat from the water into and along a short fin, making good contact, is negligible, and the fin offers much less head-on obstruction to the air. Figs. 1 and 2 illustrate this. These show the performance curves of two radiators exactly the same, except that the former has no fins and the latter has an inserted fin or strip in place of every second or alternate water passage of the former. Up to a certain speed the latter is superior, but beyond this speed its curve falls off, due, no doubt, to the fact that the fins are inserted strips, making poor contact with the walls of the water passages. If they were, in some way, integrally constructed from the metal forming the water passages, as is the case in some types, or soldered to them throughout, undoubtedly the performance of the latter radiator would maintain its superiority. Radiators with integral fins have straight curves of cooling ability throughout the average automobile range.

THIS is a continuation of the discussion of the factors affecting the design and efficiency of automotive cooling systems which followed publication in these columns last year of a series of articles by A. Ludlow Clayden on this subject.

The author of this communication submits comparative data concerning the performance of two types of cores one of which is all direct radiating surface in contact with water on one side and air on the other and the second of which has a similar frontal appearance but is composed partly of direct and partly of indirect radiating surface forming fins on the water tubes.

Figs. 1A and 2A are performance curves, taken from tests made in a free air stream, which are the only kind of general tests which have any value for comparative performance purposes, as far as passenger cars are concerned. Tests made in a closed compartment showed that the radiator core, shown in Fig. 1, was capable of dissipating more heat per pound of air passing through it (compare Figs. 1B and 2B), but also showed a considerably greater resistance (compare Figs. 1C and 2C). In other words, comparing Figs. 1 and 2, the radiator without fins dissipates less heat in a free air stream, but more heat per pound of air passing through. The conclusion is that less air does pass through in the free air stream, and this would be accounted for by the fact that it has a higher pressure drop. The only structural difference is that one core has fins in place of half the water passages of the other. The reasoning, then, that the lower resistance of the fins offsets their poorer heat dissipation is apparently sound.

The results obtained in a closed compartment would indicate that the first radiator (without fins) was, without doubt, superior to the latter, because it dissipates more heat per pound of air passing through it. In free air, however, because of the greater resistance of the finless type less air gets through and the apparent superiority is offset.

Accordingly, as a very good forecast of comparative performances on passenger cars, suspend the radiator in a large free air stream and determine its heat dissipation by taking measurements of the amount of water flowing and the temperature drop. Measure the temperature of the entering air and the speed of the air stream and take the barometer reading. The results obtained should be reduced to a standard basis and curves of heat dissipation against air speed plotted.

Radiators for use on slow-speed trucks and on tractors, on which the fan is the predominant factor in moving the air, I believe should be tested by placing the radiators in a compartment approximating the average fan, engine and hood arrangement. The results should then be plotted to show heat dissipation in respect to fan speed.

Both of the above types of tests will then show what a radiator will do, but they will not show why; and no attempt should be made to obtain further data from either of them unless it be head resistance, which is valuable in connection with airplanes. This can and should be measured directly in the free air stream tests, and should not be confused with measurements of the pressure drop entailed in drawing air through the core. The latter should be determined only in a closed compartment, somewhat as follows:

The tanks and pipes should be outside the compartment,

the core being arranged to completely fill a section of the wind-tunnel through which the air is drawn. The desired data are obtained by taking the inlet and outlet air and water temperatures, the barometer reading of the entering air, the volume of water passing per unit of time, and the air pressure drop.

The last is the most troublesome, but can be obtained very uniformly when the apparatus has been finally set up and the pressure tubes placed in proper position. By this I mean that it will not do to place the pressure tubes at random. They must be located at some distance from the core at either side to be away from eddies. The pressure drop measured near the walls will be too high, due to the skin friction of the latter. A good way to find the proper location for the tube is by the use of two movable pressure tubes which can be rotated across the core, and moved in and out. These must be used first, in finding a location such that the effect of the wall skin friction is not noticeable; second, in thoroughly covering and averaging the pressure drops of the remaining area, and third, in finding the location within this area at which the reading is the same as the average thus obtained. This location is then to be taken as the permanent location of the pressure tubes. I have used this method and found that at the various air speeds used—from 10 to 60 ft. per second—the readings always agreed, within very close limits, with the average taken with the movable tubes.

Such tests have suggested that obstruction to the air is not desirable, but this must not be taken too broadly. Resistance, due to turbulence, is, in some types of cores, at least, very desirable.

The question of the effect of changing the rate of water flow through a radiator on the cooling ability thereof, is also much discussed, but it seems obvious to me that in practice there is no effect except that caused by the resulting direct change in the water temperature drop.

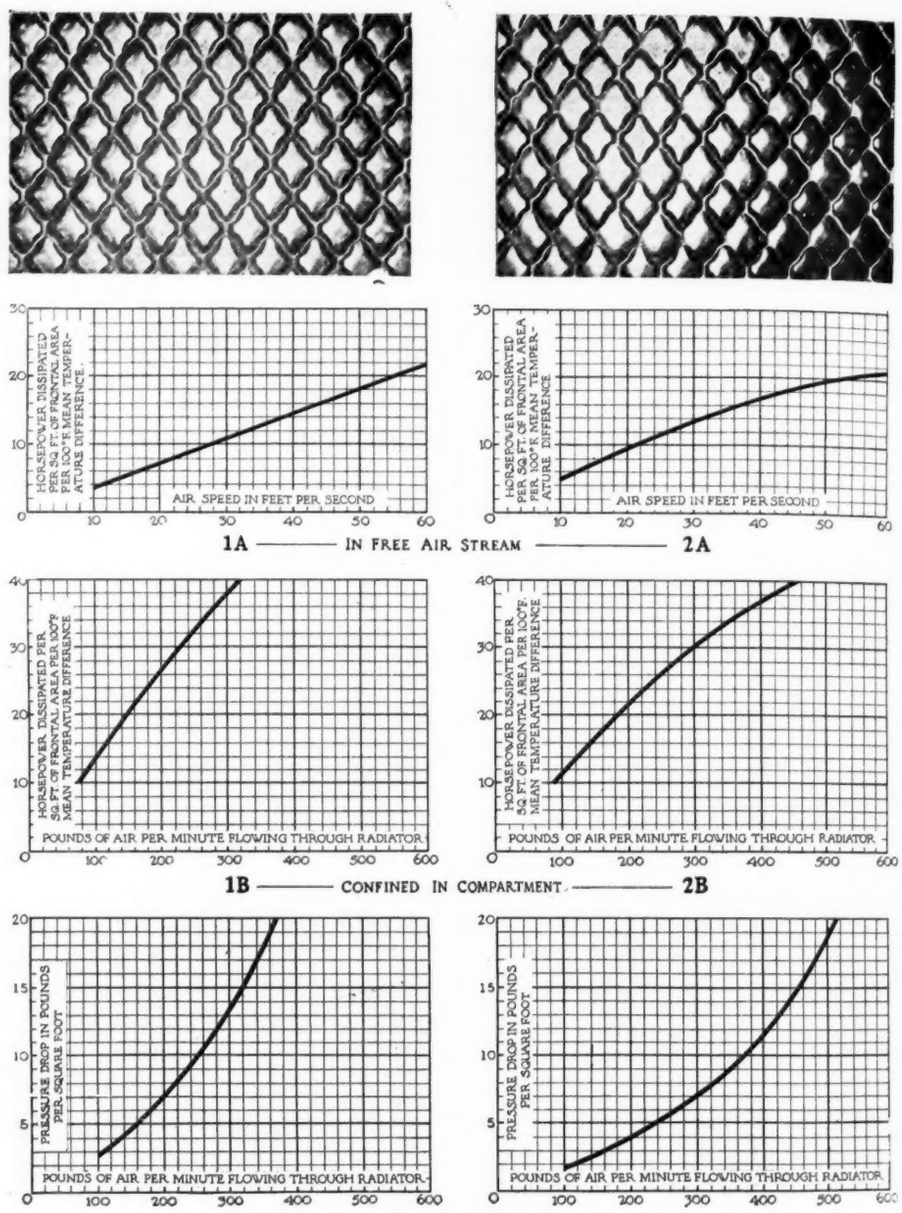

HORSEPOWER DISSIPATED PER SQ. FT. OF FRONTAL AREA PER 100°F. MEAN TEMPERATURE DIFFERENCE
AIR SPEED IN FEET PER SECOND
1A — IN FREE AIR STREAM — 2A
HORSEPOWER DISSIPATED PER SQ. FT. OF FRONTAL AREA PER 100°F. MEAN TEMPERATURE DIFFERENCE
POUNDS OF AIR PER MINUTE FLOWING THROUGH RADIATOR
1B — CONFINED IN COMPARTMENT — 2B
PRESSURE DROP IN POUNDS PER SQUARE FOOT
1C — CONFINED IN COMPARTMENT — 2C

Fig. 1—Photograph and performance curves of core having all direct or finless radiating surfaces. Fig. 2—Similar view and curves of core of similar appearance to that shown in Fig. 1 but made from alternate tubes and strips or fins, the latter forming indirect radiating surfaces

First of all, considering that the ability of air to remove heat from a metal surface is so much less than the ability of water to give its heat up to that surface and the ability of the surface itself to conduct the heat to the air, it does not seem reasonable that in ordinary use we will ever reach the point where these abilities will be affected by different frictional or turbulent conditions due to different velocities of the water over the surface.

Furthermore, in a large series of tests, which, of course, could not all be conducted under exactly the same rates of water flow and conditions of temperature, and where it was accordingly necessary to take all test conditions and reduce them to a standard basis for plotting curves (as, for instance, to the amount of heat dissipated per sq. ft. of frontal area per 100 deg. Fahr. mean temperature difference as between the average water temperature and the temperature of the entering air), the curves have always come out very uniform, and the extensions would always go through the zero point, that is, the point where the two axes of the curves intersected. If there were any other effect except that brought about by the changes in temperature due to different rates of water flow, the reduction of the figures to the standard basis mentioned above, would in some cases throw the curves out of position, so that they would not extend through the zero points.

It therefore seems entirely safe to say that the effect on cooling ability is simply that, if the amount of water going through the radiator is reduced, the temperature drop is proportionally increased and the average radiator temperature falls off. This means that the temperature difference between the air and the radiator is reduced and the ability to dissipate heat is smaller than it was in the first place.

On account of this effect I have suggested to the Radiator Division of the S. A. E. Standard's Committee that the ability to dissipate heat under a standard mean tem-

perature difference should be termed "structural cooling ability," because it is merely the ability of the external structure to give off heat under certain conditions, and cannot take water-flow into account. If two radiators, say A and B, have been tested and A shows a structural cooling ability superior to that of B, but does not pass water as well, it may be found that in practice A's performance is actually worse than B's, because less water is going through it; on the other hand, if the pump is powerful the difference in the water-flows may be so small as not to offset A's superior structural cooling ability. In this case A will be the better. In other words, different radiators may reverse their comparative standings on different installations, and unless one is superior to the other in both respects, the data is useless, unless the characteristic of the complete water system, excepting the radiator, is also known.

Probably with respect to thermosyphon systems, the resistance to water-flow of the jackets and pipes can be disregarded and comparisons computed directly from the radiator data.

S. R. SWENSON,
President Motor Radiator and Mfg. Corp.

Flexibility of Front Springs

Editor, AUTOMOTIVE INDUSTRIES:

The article by Mr. McCain in the March 1 issue of AUTOMOTIVE INDUSTRIES interests me greatly, inasmuch as I have had a couple of test cars, with a similar suspension system, on the road for almost two years.

I can confirm all the advantages claimed in this article, and believe that the transverse spring mounting has great possibilities. Inasmuch as I have combined the steering linkage with a pinion-and-rack steering gear, and get an exceptionally small "back kick" when striking obstacles is proof that the springs absorb the shock to a far greater extent than the conventional layout.

Besides the low unsprung weight that such a system affords, another cause for the exceptional riding qualities is due to the independent mounting of one wheel from the other. They are not tied rigidly together by an axle between them.

As will be seen by the accompanying cut a Y-shaped lever is mounted on a rod attached to the rack of the steering gear; the rod extends transversely across the car. A ball end is located at the extremity of each portion of the Y and a conventional type of drag link is used—one extending to each steering arm. The balls on the Y lever are three inches apart, thus allowing either link to be mounted or dismounted without interfering with the other. At the same time the balls are so close to each other that no inaccuracy results therefrom, and the steering is independent from the spring action. The construction eliminates wheel wobble as the drag link and the main leaf of the spring form two sides of a parallelogram.

Each spring is different from the other in that the lower spring has a greater number of thin leaves and the upper a lesser number of thick leaves. Their unit deflection is approximately the same, but having a different period of vibration, they will not synchronize, and when striking a corduroy road, after a few oscillations, the car will straighten itself out.

Furthermore, instead of the springs being rigidly fastened to the frame at the center, they are pivoted thereto, and means are provided to brace the springs in order to relieve the center pivot from the twisting which would otherwise come upon it.

If one wheel strikes an object before the other (it seldom occurs that both wheels strike an object at exactly the same time) the spring resolves itself into a cantilever system, and the whole length of the spring is utilized. Of course, if both wheels strike an object at the same time with the same intensity, the effect would be the same as if the springs were rigidly clamped to the frame. Furthermore a three-point suspension of the frame is thus secured. The front end becomes exceptionally sensitive.

Inasmuch as a cantilever effect is utilized, I use a higher unit deflection than does Mr. McCain, namely, 350 lb. per in. for the front end. The rear end, which uses transverse springs which are rigidly secured to the frame at the center has a unit deflection of 200 lb. per in. These figures are for a car weighing 1950 lb. ready for the road.

It will be seen that the drag-link layout allows for pivotal action of the front spring unit, as well as for spring deflection.

Special means are used to convey the drive from the engine to the rear wheels, in order to allow free spring action, and still provide a drive which does not necessitate the use of short universal-joint drive shafts.

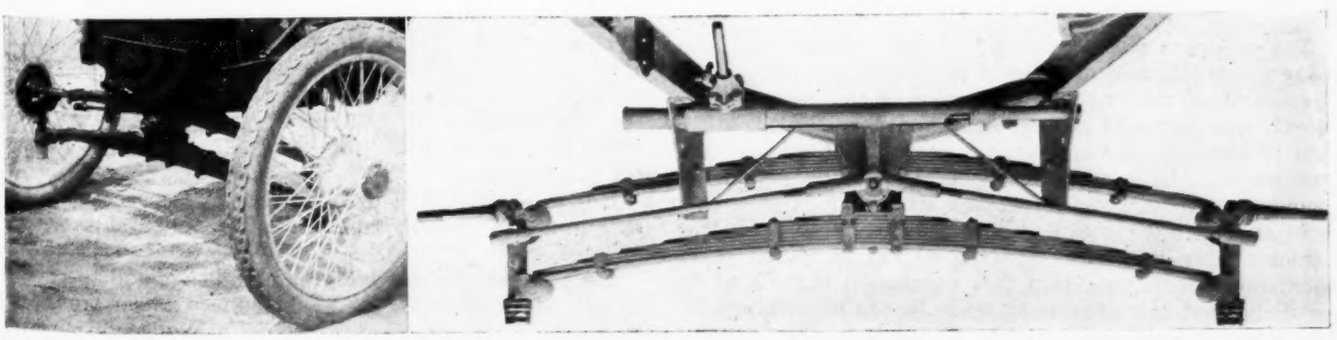
AUSTIN M. WOLF.

Imports Into Great Britain

THE following table shows the imports of passenger cars and chassis into Great Britain during the first nine months of 1922.

MONTHLY IMPORTS OF MOTOR CARS AND CHASSIS INTO GREAT BRITAIN

	Passenger Cars and Trucks		Chassis	
	No.	Value	No.	Value
January	690	£120,570	684	£140,750
February	865	165,094	1,009	340,979
March	946	168,041	636	133,736
April	1,150	190,953	614	113,211
May	1,505	234,270	1,451	214,750
June	1,077	204,124	655	128,712
July	1,500	257,953	484	102,247
August	1,567	251,500	515	93,370
September	1,331	223,840	605	105,267
Total (9 mos.)	10,631	£1,816,345	6,653	£1,373,022



Wolf transverse spring mounting. Steering linkage is combined with a rack and pinion steering gear

Department Store Men Discuss Use of Truck in Delivery Service

Organization and selection of drivers of more importance at present than mechanical features. Big Pittsburgh store scraps vehicle after it has covered 50,000 miles. Horse is still of value, but motor transport is gaining. Research results given.

By David Beecroft

THREE topics of major interest to motor truck manufacturers were discussed thoroughly at the annual convention of the International Retail Delivery Association held in Chicago March 12 to 15.

A spirited argument was precipitated by Walker Rosenbaum of the big Rosenbaum department store in Pittsburgh, when he stated that his organization finds it economical to scrap the trucks in its large fleet after they have covered 40,000 to 50,000 miles.

E. A. Stedman, vice-president of the American Railway Express Co., defined the relative fields of the gasoline trucks, the electric truck and the horse as determined by recent investigations made by his company.

George A. Green, general manager of the Chicago Motor Coach Co., provided the third discussion of importance to vehicle builders when he said: "The motor vehicle is so little understood that the selection and education of those to operate and maintain it are more important than even mechanical features at the present time. In considering the operation of motor vehicles, we must not focus our attention on mere things, but rather on living persons, because it is the selection and education of these persons that largely determine the success and efficiency of the service which the vehicles give."

Representatives from 300 department stores of the United States and Canada attended the convention, and had the opportunity of hearing a number of able papers on delivery problems. The purpose of the meeting was to study delivery problems, chiefly those pertaining to motor delivery. Most of the large department stores operating over 100 trucks were represented, as well as the smaller stores with fleets of twenty or more vehicles.

Importance in Education of Personnel

The program was exceedingly varied in character, covering the entire field of delivery activities. At every turn it emphasized the fact that the motor or the horse vehicle is only one factor in the problem, and that the organization to keep the vehicle moving, maintenance plans, cost systems and the selection and education of personnel are equally as important as the vehicle itself.

In announcing the policy of his company to scrap the vehicles after they have covered 40,000 to 50,000 miles each, Rosenbaum said that this conclusion was based on an analysis of cost operations made by the Rosenbaum Co. and firms of accountants. As the result of the analysis, the Rosenbaum Co. purchased a new fleet of thirty-eight vehicles during 1922. The company estimates that it is going to save in maintenance cost practically all of the $74,000 outlay necessary in purchasing this fleet, during a period of three years.

Since vehicles in department store service average approximately 15,000 miles per year, it means that a new fleet will have to be purchased every third or fourth year. This applies to Pittsburgh and similar areas where pavements and geographical conditions are of like nature. Rosenbaum estimates that one mile of travel in Pittsburgh is equivalent to two and one-half to three miles in other places where pavement conditions are better and hills are not so numerous.

Policy of Scrapping Vehicles

This address provoked discussion that continued throughout the convention. Opinion is divided between those who favor discarding vehicles when repairs become heavy, and those who believe in keeping maintenance at 100 per cent and in keeping a vehicle operating as long as possible.

E. A. Stedman outlined how his organization with 11,710 vehicles divides the field among gasoline, electric and the horse-drawn vehicles, studying the capacities of each and providing for each a definite field of operation. Stedman's figures are based on study of the fleet operated by his company. The 11,710 vehicles are divided as follows:

Double horse vehicles	4,500
Single horse vehicles	3,700
Gasoline trucks	2,310
Gasoline tractors	40
Electric trucks	1,160
Total	11,710

The motor vehicle is gradually replacing the horse in cities, and as street improvement continues the rate of replacement will gradually increase. In the Chicago zone the American Railway Express Co. has purchased no horses since November, 1921, but last year bought 407 trucks for this territory.

Horse vehicles with their mileage and speed limitations still provide cheapest transportation under suitable conditions.

Electric vehicles provide greater mileage and speed than horses at reasonable cost. Electric trucks are useful when these advantages are requisite and conditions permit their use.

Under similar conditions, gasoline motor trucks give even greater mileage and speed, although generally at a higher cost. The cost is reasonable, however, for the additional work which may and should be required of them.

The American Railway Express Co., Stedman says, has a standardized basis upon which to decide upon the type of vehicles to be used. The respective fields for the three classes are concisely summarized as follows:

Horse Drawn Vehicle Field

a—Where all or a large part of street pavement is poor.
b—Where stops are frequent and distances between stops are short.
c—Where stabling costs are low.
d—Especially where all three of the above conditions exist.

Electric Motor Truck Field

a—Where streets are well paved and level.
b—Where daily tour of duty is fairly constant and of limited mileage.
c—Where electric current costs are low.
d—Where conditions of service indicate that the same equipment will be required for many years.

Gasoline Motor Truck Field

a—Where street pavements are generally good but not level.
b—Where long hauls with infrequent stops are found.
c—Where stabling costs are high and electric current costs high.
d—Where changing conditions may require shifting equipment to other points or the sale or exchange of equipment and replacement with different units.

Horse Versus Motor Vehicle

Besides defining the respective field for the horse, the electric truck and the gasoline truck, Stedman set forth the advantages and the disadvantages of each.

The advantages attributed to horse-drawn equipment are:

a—The vehicles are interchangeable between cities and towns where such equipment is still used.
b—Fewer and less serious accidents. Horse sense is added to driver sense.
c—Depreciation and repair costs are low.
d—The horses' need for frequent rest is met by frequent stops on routes without delaying service.

The disadvantages of horse-drawn equipment are:

a—Stable space is becoming a problem in cities.
b—It is difficult to find public horse shoers within reasonable distances.

The advantages of electric equipment are:

a—Simple to control as compared with gasoline trucks.
b—Provides cleanest vehicles for special conditions.
c—Requires fewer running repairs, resulting in less detention in shop.
d—Depreciation and repair costs are low as compared with gasoline trucks.
e—Causes no expense while idle at stops.

Disadvantages of Electric Equipment

The disadvantages of electrical equipment are:

a—Greater first cost including batteries and charging boards, the latter costing from $175 upward per outlet, depending on the capacity of trucks.
b—Batteries when nearing the end of their useful life deliver reduced speed, reduced mileage, or both. This raises serious problems in economic operation. Power can be maintained by early replacement if cost is a subordinate matter but where cost is a vital factor, chances may be taken in the matter of speed and mileage.
c—Reduced efficiency in winter months in northern States.
d—Not so generally interchangeable with equipment in other cities or towns.

The advantages of gasoline motor trucks are:

a—They are available for long distance emergency service after a full day's work.
b—The source of power, gasoline, is available practically everywhere.
c—They can carry heavy loads better than electrics.
d—They can maintain speed to the end of the day's work better than the electric or the horse-drawn vehicles.
e—They are more generally interchangeable among cities and towns than are electrics.

The disadvantages of gasoline motor trucks are:

a—Less days of productive service on account of more frequent repairs necessitating more extras to keep a given number on the streets.
b—Greater fire risk.

Green, in his opening remarks, expressed his conviction that the fundamentals of motor vehicle operation are the same whether the vehicles are motor buses, heavy gasoline trucks, light gasoline trucks, electric vehicles, or tractors with trailers.

Other speakers at the session included E. E. LaSchum, general superintendent of the American Railway Express Co.; Norman J. Smith, general superintendent of transportation, Consumers Co.; J. L. Hanley, in charge of distribution, J. L. Hudson Co., and David Beecroft, Class Journal Co.

Graphs Used in Predicting Airplane Performance

A SET of airplane design graphs, by the use of which it is possible to predict, within reasonable limits, the performance and maneuverability of airplanes, has recently been prepared by W. F. Gerhardt and F. W. Herman, aeronautical engineers at McCook Field, assisted by M. L. Snodgrass, and published by the Airplane Engine Encyclopedia Co. These graphs are supplied in the same cover with some twenty pages of printed matter in which the nature and use of the graphs is fully explained.

The charts enable graphical solution of problems relating to the performance of airplanes having a certain predetermined dimension characteristics. In the determination of these relations all the most important theoretical and practical developments in aeronautics, wind-tunnel experimentation and flight testing are said to have been used. The validity of the relations considered are understood to have been established by the analysis and performance of a large number of existing airplanes already flight tested and the design of several new types.

According to the authors, the graphs were developed in answer to a demand for a system which would be completely general, that is, which would take into account all the factors affecting the performance of an airplane and yet be sufficiently simple to be practically usable by the average engineer and designer.

The graphs are based upon independent methods, developed by L. V. Kerber, Prof. E. P. Warner, Prof. Prandtl and Dr. de Bothezat.

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Credit Caution Advisable

"WATCH credits!"

This would be a good slogan for every one in the automotive industry to adopt for a few months.

In times of prosperity lines of credit are extended almost automatically. This is one of the reasons for huge frozen credits in times of comparative adversity. It explains why farmers and other business men still owe a lot of money as a hang-over from the prosperity spree which ended in 1920.

There is not available at this time any large amount of bank credit without having recourse to the Federal reserve banks and this system was not designed to supply credit under normal conditions except for seasonal fluctuations, such as those attendant upon crop movements. In a period of speculation and rising prices, too great a demand for credit is not a healthy condition.

One other factor which the industry should keep in mind is that orders on the books do not always mean deliveries. A great many automotive manufacturers have painful recollections of the flood of cancellations which followed the slump of 1920. It even took them a long time to work off the partly fabricated materials they had on hand.

There is nothing in the industrial or economic situation to occasion alarm if caution is exercised, but conditions are not sufficiently stable to warrant careless navigation.

Front Wheel Brakes Are Coming

IT is no secret in the industry that several passenger car manufacturers are giving serious consideration to the adoption of front wheel brakes in the near future. The rapidly increasing popularity of these brakes in Europe has been frequently mentioned in these columns and several articles dealing with their design and construction have been presented for the information of our readers. Late information concerning French, Italian and Belgian practice is given in an article on another page of this issue.

Engineers who have given the subject of brakes careful study are generally agreed that there is room for much improvement in the braking system of the average American car. British and Continental designers have given this matter more consideration on the whole than have engineers in this country. Consequently brakes fitted on foreign cars are frequently better designed and better built than those on many American cars.

There is not the least doubt that the automotive industry can benefit greatly by making the American passenger car a safer vehicle to operate. While the appalling number of deaths which result annually from the operation of motor vehicles in this country is by no means attributable in any large degree to vehicles of faulty design, many serious accidents do result from brakes which are either faulty in original design or which have been allowed to deteriorate in service until they have become unsafe.

It is not meant to infer that all American cars are deficient in respect to brake design, but there are few indeed in which there is not some room for improvement. It does not necessarily follow that four-wheel brakes are desirable in all cases, or that a car so equipped will be entirely free from accident in which the brake system is a factor, but it is quite generally admitted that a car with well designed four-wheel brakes can stop much more quickly than one not so equipped.

This very fact has resulted, in some cases, in rear end collisions, when cars equipped with less effective brakes are unable to stop in a short space and are therefore apt to collide with the rear of a car with four-wheel brakes which is stopped with unusual abruptness. The use of four-wheel brakes involves some problems in addition to the increased first cost which it entails. On the whole, however it is probable that much more can be said in favor of four-wheel brakes than against them and their early adoption by some manufacturers appears to be quite probable.

Educational Work Needed to Counteract Move Against Good Roads Expenditures

ONE of the serious phases of current thought, especially in the agrarian districts, to which the automotive industry should give attention, is the reaction against the expenditure of large sums for the construction of improved highways. This reaction is fairly general and covers many States. Some legislatures have adopted resolutions putting themselves on record as opposed to the acceptance of Federal aid.

As one highway official expressed it, "the farmers will have to be sold all over again on the economic advantages of better roads."

Explanations of the animosity toward heavy highway outlays are not hard to find. Railroad and traction interests have been carrying on for years a vicious propaganda designed to make the farmer think he was "holding the bag" and paying the bills for something which would benefit "city slickers" more than anybody else.

Much of this propaganda was put out through country newspapers and nothing really constructive ever was done to counteract its effect. Some of the railroad propagandists have been clever, too—mighty clever. They actually seem to believe a good bit of what they write.

When a farmer once has been convinced that a thing is good for him and then makes up his mind he has bought a gold brick, it's a tough job to convince him a second time. Whoever undertakes it will need a lot of ammunition in the way of facts for it's going to require a powerful lot of persuasion.

Mr. Farmer will insist on being shown exactly to what extent the value of his property will be enhanced by different types of roads; he will want data on the extent to which heavy trucks damage hard surfaces and he will be likely to inquire why motor vehicles shouldn't pay more than the maintenance costs of roads.

It will be possible to answer most of these questions honestly and convincingly, but to do so will require knowledge of all the facts extant. It is possible the Motor Vehicle Conference Committee may find it necessary to revamp some of its ideas.

The Bureau of Public Roads has several important surveys well under way and no unnecessary time should be lost in giving the public the benefit of the knowledge obtained. There is little enough information at best in reference to highways and highway transport. Facts are vastly more valuable when they are timely than when they relate to ancient history.

One of the surveys will be designed to show the effect of the spread of the cooperative marketing movement upon the use of motor trucks. Another will show the effect upon land values of various types of road. A preliminary survey of four types of roads in four counties in the same State is understood to indicate a very sharp accretion in values by changing from dirt to gravel, but a much smaller gain by shifting from gravel to macadam or concrete.

Another investigation shows that 88 per cent of the highway funds go for county roads and only 12 per cent for the hard surfaced State roads which bear the brunt of criticism as "automobile boulevards." If all State roads were eliminated, therefore, only 12 cents on the dollar would be saved.

This information would be tremendously valuable in dealing with farmers on the question of highway bond issues. The automotive industry needs all the facts in determining its stand upon these questions.

Factory Output Big as Month Advances

Earlier Schedules Increased as March Moves Toward Real Buying Season

NEW YORK, March 19—Increased activity marks the operation in the major automobile producing plants as the month approaches the opening of the real buying season of the year. Factory schedules are moving along at the pace promised at the beginning of March with deliveries of finished products relying more and more upon the efforts of dealers to drive cars away from the factory to point of destination.

Capacity operations among the larger car makers follow the active demand reported in the sales field, manufacturers reporting a volume of orders that will justify high schedules for some time to come. The demand for automotive products is being experienced not only by car makers but with truck builders and, to a notable degree, among tractor manufacturers, and bears out early indications that with better conditions existing in all branches of industry, business in motor vehicles would make a strong advance.

Tractor Interest Improves

Tractor interest is moving strongly, particularly in sections of the Southeast, and with pronounced improvement in the western territory. In the latter districts, however, conditions are somewhat spotty, with the season yet too early to judge of the extent to which farmers will go in their expenditures. Last year was a slack period and for that reason purchasing in large volume should come this year. Demand for trucks is swinging more and more toward agricultural sections with steady gains noted in industrial centers.

The problem of delivery of automobiles will become less severe as the month lengthens and better weather conditions permit more driveaways. Boat service from automobile manufacturing centers is looming in sight and with more extensive shipping facilities provided this year will relieve those sections where rail equipment is inadequate and driveaways not feasible.

Instead of showing signs of improvement, the rail situation insofar as shipment of automobiles is concerned is somewhat worse than it has been, although a greater number of car

(*Continued on page* 696)

Business in Brief

NEW YORK, March 22—Trade and industry continue to make great surges forward. Some lines have broken all records, including those of the war years. Two changes have appeared—one, the tendency to anticipate future requirements, and the other, a renewed activity in retail trade which has been lagging behind the wholesale.

The iron and steel industry has surpassed all records and is now producing at the rate of 44,000,000 tons a year. The Franco-German situation has caused orders to be placed with American concerns. Prices have advanced steadily, and as yet have not reached a point to check consumption. Pig iron prices advanced $1 last week in many cases, and crude steel prices have taken a similar jump.

Railroads report record freight traffic. Transportation delays and shortage of cars have been felt industrially. Transportation congestion is mirrored in the figures for car loadings for the week ending March 3. The aggregate was 917,896 cars, or an increase of 87,673 cars over the previous week. January railroad reports show a decided gain in gross revenues, and the present outlook is for a record year in freight movement.

Inclement weather has retarded retail trade but has helped the winter wheat crop and benefited the soil for cotton planting. Sales of rubber footwear have been heavy, while shoes have been slowed up.

The stock market was less active last week and profit-taking caused an occasional set-back. Many industrials recorded sharp advances. Foreign exchange was irregular. The bond market remained heavy.

$2,000,000 to Be Spent on Glass Plant Additions

TOLEDO, March 20—Due to the unprecedented demand for plate glass by the automotive industry, the Edward Ford Plate Glass Co. at Rossford, a suburb of this city, has let contracts for six additional factory buildings to cost $2,000,000, which will increase its output by approximately 40 per cent and give it an annual production of 16,000,000 sq. ft. of glass.

The company has also announced a wage increase of five cents an hour to its more than 1000 employees. Record breaking orders were given as the reason for the wage boost which will affect all employees and officers of the company. About six months ago the wages of the glass workers were raised.

Higher Prices Likely Due to Material Cost

Certain That Most Manufacturers Will Increase Lists of Individual Models

DETROIT, March 20—Most manufacturers are again agitated over the subject of prices. It is the general expectation that increases will become necessary within a short time because of rising material costs. It is asserted that the larger production companies would be forced to make advances immediately if their output were curtailed for any reason.

Most companies are practically certain to make price increases on individual models which cost so much to turn out that there is no profit in them at the present price. Some of these advances probably will be disguised by the addition of certain equipment, and other companies will gain the same result by discarding some of the regular equipment.

Those companies which have contracts for materials which were placed some time ago when prices were lower will be able to continue at the present list until these contracts expire.

While it often is asserted that buying is heavier on a rising than on a falling market, manufacturers assert they will not increase prices unless it becomes absolutely necessary.

The Hupp Motor Car Corp. has informed its distributors and dealers that there is no truth whatever in reports circulated late last week that it had raised its prices $75 to $150.

Prices Being Discussed, Forbes Says

BUFFALO, March 19—In a statement to stockholders, Myron E. Forbes, president of the Pierce-Arrow Car Co., states that at the rate orders were booked in January and February production this year will be at record figures.

"However," he says, "advances in cost of material and labor are lessening our margin of profit and, unless automobile prices are advanced to correspond, earnings will not show to as good advantage as output. Several large automobile manufacturers are talking of advanced prices to meet this situation and it is certain that if any prominent manufacturer breaks the ice the others will follow."

C. G. SPRING MOVES OFFICES

KALAMAZOO, MICH., March 19—The C. G. Spring Co. has completed the removal of its executive offices from Kalamazoo to Detroit. Christian Girl, president; Fred Cornell, sales manager; Herbert L. Jandus and Wayne Dunston, engineers and the company's chief accountant will be located in the new headquarters. Charles Getler, assistant to Girl, remains in Kalamazoo as manager of the chief production unit.

Durant to Build Car Pricing It at $525

Bears No Name as Yet, but Will Be Built in Flint and Oakland Plants

NEW YORK, March 22—Another car, as yet unnamed, but which will list at $525, is announced by Durant Motors. It will be a four-cylinder job, powered with a Continental engine, and will be built at Flint, Mich. It will not make its début until late in the summer, and at the present time no subsidiary company has been formed to manufacture it.

The plant at Flint is now in course of construction, the foundations being already in. It will be a duplicate of the other Durant plant at Flint and its cost will be $1,500,000. The capacity will be 90,000 cars a year, but no decision has been reached as to the first year's output.

It also is planned to build some of these cars in the Durant plant at Oakland, Cal. The Pacific Coast price will be $665.

This newest member of the Durant family is designed to meet Chevrolet competition. It has been under consideration for some little time, but it was not until W. C. Durant visited California a couple of weeks ago that plans for production were completed.

Outside of the fact that the Continental engine will be used, no other units have been disclosed. The company has not settled on body styles, and up to the present only the chassis has been put out. A few of these are on the road and are being given thorough tryouts, so that when the Flint plant is completed the engineers will have fully decided what units will be selected.

With the addition of the unnamed model, Durant now has a line ranging in price from the Star at $348 to the Locomobile at $9,500. In addition to the three already named, there are the Durant four for $890, the Flint at $1,195, the Durant six at $1,650 and the Princeton at $2,485. Of these the Flint, Princeton and the latecomer are not in production as yet.

HUDSON SHIPPED 18,773

DETROIT, March 17.—Reports for the first quarter of its 1923 fiscal year show that the Hudson Motor Car Co. shipped 18,773 cars compared with 8994 in the same period last year. The shipping schedule for the second quarter calls for 25,780 cars. Production for the fiscal year ended Nov. 30, 1922, amounted to 61,223 cars.

NORTHERN WHEEL RECEIVER

DETROIT, MICH., March 20—The Northern Wheel Co. of Alma, Mich., has been placed in receivership on application of F. W. Ruggles, one of the principal creditors, as a means of conserving the assets of the company. Orville Allen of Alma is the receiver. A reorganization of the company will be effected, it is reported, with James F. Moulton of Grand Rapids taking an active part.

FULLER AND D'ARCY GAINING

KALAMAZOO, March 22—The plants of the Fuller & Sons Manufacturing Co. and the D'Arcy Spring Co. are working at steadily increased capacity, and both concerns report that the outlook for future business is unusually good. They are taking on additional help every week and expect to be back to maximum production within 60 to 90 days.

Prosperity in All Lines of Trade Should Continue Without Interruption for Next Ten Years

By CHRISTIAN GIRL,
President of the C. G. Spring Co.

Detroit, March 20.

SHORTAGE of steel and railroad facilities during the year instead of exerting a harmful effect on the automotive industry, will re-act favorably in that it will extend the present period of prosperity over a longer time and will not permit manufacturers to exhaust it in one spurt of manufacturing.

Business will continue to improve steadily in my opinion until at least 1925 and there should be no serious interference with orderly expansion and development in all lines inside of ten years.

Prices on all commodities fell to too low a point following the war and the automotive industry was the only one which came through this experience with practically unimpaired vigor. Advancing prices will help business, provided they do not advance to unwarranted heights. This country could not proceed to pay its debts on a deflated market.

Through the operation of the tariff and due to other economic causes prices are getting back to points below which they never should have fallen. Because of the resourcefulness of car manufacturers the industry has been able to bring prices to extremely low levels and still make money, but this condition has not been true of other industries. In the agricultural field low prices were ruinous.

The industry has been suffering from an excess of parts since the war, due principally to the demand for metal products in the war period. War factories have been seeking to find work for their machine tools in the automotive industry and there was not enough work to go round. Time will cure this by the gradual growth of business to absorb these plants and facilities and by the development of other products for which a market can be established. In the war period all of the building was for industrial purposes. We are now getting the opposite reaction of building for housing.

Failure of the railroads in the past to meet public transportation requirements has been largely responsible for the growth of the automotive industry. Unable to get the transportation it required from the railroads, the public turned—not to the next best thing, but to something better. There is no question but that the railroads will be little better equipped to handle transportation in the future than they have in the past. That means more automobiles. The future transportation requirements of the nation will be built upon an automotive basis.

All highway measures making for expansion and improvement should have the indorsement of the industry, because upon the highways it must depend largely for continued growth. Here in Michigan we are facing a proposal to raise money for highways by imposition of a tax on gasoline. That it is money to make highways better is the important fact. Whether it taxes unfairly is a question of the efficiency of the car. To my mind a tax of this kind is a splendid thing for the industry because it will stimulate engineers to produce cars giving maximum economy in operation.

Tests of this kind have made the industry what it is today. There have been obstacles in the past all of which have helped to make for greater strength. It is an aggressive industry and, maintaining its aggressiveness, it will continue to be just as successful as it has been in the past.

New High Level Reached in Rolls-Royce Output

SPRINGFIELD, MASS., March 20—Rolls-Royce production here is at a new high level this month, owing to an increased demand from many quarters. Fully ten chassis a week are being turned out, and the enlarged coach works, now in complete operation, are producing an equal number of bodies.

The absence of any drop in sales, as is common before the show season, was an encouraging factor at the plant this year. Business thus far this month is reported good.

Three Tool Makers Form Consolidation

Capital Is in Excess of $1,000,000 —Purpose Is to Improve Service

GREENFIELD, MASS., March 19—The Frank O. Wells Co., Inc., and the American Tap & Die Co. of this city and the Williamsburg Manufacturing Co. of Williamsburg, Mass., have consolidated, with Wells as the holding company. Joint capital represented in the merger is in excess of $1,000,000.

Frank O. Wells is president and consulting engineer of the new corporation, with L. E. Peck, general manager of the Frank O. Wells Co., as vice-president and general manager. David B. Miller, Wells' production expert, also goes into the new concern. A. B. Allen of the American Tap & Die Co., is secretary and treasurer of the consolidated company, while Herbert J. Smith will continue as superintendent of the American Tap & Die division.

Personnel Not Changed

No changes in the personnel of the several organizations are planned, while the board of directors will include men of prominence in manufacturing and financial circles in Greenfield, Boston and New York.

The merger, it is stated, is in the interest of better service and to bring into the hardware and machine tool market more quickly and efficiently a series of interesting tool innovations. The consolidated company will make possible many savings in financing, management and sales, it is said, and the immediate development of each plant is to be undertaken.

President Wells, who is the dominant figure in the merger, started in the tap and die business with his brother under the name of Wells Bros. in 1876 with a capital of $1,100. In 1912 he organized the Greenfield Tap & Die Corp., of which he was president up to the time of his resignation early in 1919.

Wells Devoted Time to Research

Freed from business cares, he devoted all his time to the development of new machines and tool innovations, and his research work included a trip to Europe to study the tool changes brought about by the war. Upon his return he brought all his experimental work to Greenfield, the organization of the Frank O. Wells Co., Inc., being the final outcome. Its product consists of a line of thread-cutting tools, reamers, counter bores, broaches, broaching machines, tap and drill grinding machines and a number of new tools into which are incorporated the results of Wells' development work.

The American Tap & Die Co., which succeeded in 1902 to the business of Nichols Bros., manufactures a line of standard screw cutting tools and a line of butchers' cutlery and supplies. The Williamsburg company makes a line of screw drivers, iron levels, hacksaw and butcher saw frames and a line of household tools.

ENGINES ARE DUTIABLE AT 40 PER CENT RATE

WASHINGTON, March 20—The customs division of the Treasury Department holds that internal combustion engines are dutiable under paragraph 399 of the Fordney-McCumber tariff act at the rate of 40 per cent.

The ruling grew out of a letter received from the collector of customs in New York, regarding articles which are properly dutiable under the provisions in paragraph 372, for "all other machines" which provides for a duty of 30 per cent.

Under dictionary definitions, the decision says, whether the motive force is steam or otherwise, engines are in fact machines.

It is stated, however, that as commercial designation ordinarily controls the classification of imported merchandise the department is of the opinion that notwithstanding internal combustion engines, for instance, are machines within the dictionary meaning, they are not so known commercially and accordingly are dutiable under paragraph 399.

Mercer to Recapitalize Through New Stock Issue

NEW YORK, March 19—Mercer Motors Co.'s plan for readjustment of its debt and for recapitalization calls for the creation of a new issue of Class A stock, not to exceed 250,000 shares of $4 par value each. Of this the common stockholders are asked to purchase 100,000 shares at par, the proceeds to be used for working capital.

Holders of the $1,495,475 outstanding four-year 7 per cent sinking fund collateral notes will have the option of exchanging their notes for the remaining 150,000 shares of Class A stock on the basis of 100 shares of stock for each $1,000 note or $200 in cash and fifty shares of stock for each $1,000 note.

The cash for the latter option is to be raised through stockholders buying the stock not taken by noteholders at the stated amount of $4 a share. There will be no change in the position of the holders of the 8 per cent sinking fund bonds.

WINTHER TRUSTEE CONFIRMED

MILWAUKEE, March 19—The appointment of Alex B. McCall of Kenosha, Wis., as trustee in bankruptcy of Winther Motors, Inc., Kenosha, has been confirmed by the Federal Court at Milwaukee.

Preston Motors Put in Receiver's Hands

Company Claims Solvency—Efforts Will Be Made to Effect Reorganization

BIRMINGHAM, ALA., March 19—On an involuntary petition for bankruptcy filed by creditors, the Preston Motors Corp. has been placed in the hands of John S. Coxe, Birmingham, representative of the Scott-Perry Co. of Chicago, as receiver. The petition filed alleges that the company had committed acts showing insolvency on or before March 1, when it transferred more than $2,000,000 to certain creditors.

In appointing a receiver, Federal Judge W. L. Grubb authorized the operation of the drop forge plant and provided for immediate investigation tending to show whether the operation of the entire plant should be continued.

President Skinner of Preston Motors stated that steps would be taken immediately to call a meeting of the stockholders for reorganization purposes and to secure the cooperation of the creditors to that end.

Attorneys representing the company at the hearing said that in their opinion the company was solvent in every sense of the word and in their judgment had not committed any act of bankruptcy. They stated, however, that they would not resist the appointment of a receiver, should he be empowered to keep the organization intact and to continue operations.

Coxe stated that it was his intention to work with the company and creditors in an effort to secure a reorganization, which would be beneficial to all concerned. Three concerns of New York City, claiming a total indebtedness of $7,680, were the interested parties in filing the petition. They were the Hildreth Varnish Co., S. F. Hendricks Co. and the Export American Industries.

Brown-Lipe-Chapin Makes Differential Carriers

SYRACUSE, March 21.—The Brown-Lipe-Chapin Co., of this city, which was recently acquired by the General Motors Corp., has begun production of differential carrier units for one or more cars in the General Motors group. This new line of production was intimated some time ago.

Syracuse's automotive industry plants are all working full time now and have increased production schedules. The H. H. Franklin Manufacturing Co., producing 60 cars a day, is at the highest production point in its history. The New Process Gear Corp., recently taken over by the Durant interests, is operating some parts of the plant with night shifts in order to meet a record of 60,000 differential sets this month.

G.M.C. Gives Review of Last Four Years

Annual Report Tells of Troubles Due to Big Inventory and Other Causes

NEW YORK, March 19—Net earnings of $51,807,448 in 1922 as a result of net sales amounting to $463,706,733, the greatest in its history, are shown in the annual report of the General Motors Corp. In the same document is the official announcement that the tractor division has been liquidated at a loss of $33,240,044 and the Janesville, Wis., plant, in greater part, has been turned over to other uses.

Four years of business are dealt with in the report, and President Pierre S. duPont goes into minute details in relating the embarrassments occasioned by a top-heavy inventory, on which the total loss has been $63,910,810, and what he terms "loose and uncontrolled" methods prior to 1920.

Liquidation Loss in 1920

Discussing the financial difficulties of the latter part of 1920 and the year 1921, duPont comments:

At the close of the year 1920, the net working capital, exclusive of notes payable, in use prior to the write-off of inventories, was $242,830,271, or $116,354,034 above the amount required (December, 1922) to carry more than double the production of the earlier period. This made it necessary to borrow a maximum of $82,784,824 (on Oct. 31, 1920). The reduction of the surplus materials purchased at high prices, and of inventory and other commitments made prior to December, 1920, resulted in a total liquidation loss of $84,869,893.

This condition of affairs was not reached without anticipatory warning. In the month of March, 1920, the president presented to the executive committeee a schedule of proposed production made possible by the construction and expansion program then well on toward completion. He proposed that this schedule be adopted for the year August, 1920, to August, 1921.

Though approved at the time, the schedule was revised in the month of May, 1920, to a proposed production almost identical with that in force during the last nine months of 1922. At this early date (May 13, 1920) the executive committee and finance committee noted the continued increase of inventories (to $167,965,641 on April 30, 1920).

Aimed to Halt Big Inventories

The chairman of the finance committee explained fully to those in charge of operations of the corporation the necessity of control, and, at his suggestion, a committee was appointed to allot among the divisions of the corporation the $150,000,000 considered available for inventories. The chairman also stated that it was necessary not to increase inventories beyond this amount during the succeeding twelve months.

The report of the inventory allotment committee was presented and approved before June 1, 1920. It was unfortunate that the rulings of the executive and finance committees and their cautions remained unheeded. As a result inventories reached a total of $209,000,000 at the end of October, 1920, exceeding by $60,000,000 the allotments of the executive and finance committees and by $100,000,000 the amount in actual use during the active summer of 1922. This excess accounted for about 70 per cent of the borrowings at that time.

It was doubly unfortunate that the spirit of the committee rulings was totally disregarded by a few of the divisions, the losses of which, due to expanded inventories and commitments for the future, amounted to $48,579,872 or much more than the total operating deficit of the whole corporation during the year 1921. The operating losses of these divisions during the liquidation and reconstruction period of 1921 added $15,330,938, making a total of $63,910,810 on their accounts.

Still further on the report says:

Three considerations make recurrence of the 1920-1921 disaster seem unlikely if not impossible. First, it is very doubtful if the sharp decline in prices witnessed during the period will recur. The extreme rise was due to the war and deflation was more precipitate than ever before known. Second, a complete system of inventory and purchase control has been established in the corporation. This system embraces a monthly statement of inventories and future commitments beyond which the divisions are not permitted to proceed without specific authority. Under this system a shrinkage in business such as occurred in the years 1920-1921 could not result in a repetition of the inventory troubles of those years. Third, the system of consolidated cash control installed during the year 1922 makes possible more effective use of the funds of the corporation.

The purpose of the above recital is to show definitely that the troubles of past years were not related to an ill-financed expansion pro-

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G. M. C. ANNUAL REPORT SHOWS CURRENT ASSETS MADE BIG INCREASE OVER LIABILITIES

NEW YORK, March 19—The annual report of the General Motors Corp. for 1922 details the current and working assets and the current liabilities as follows:

	Dec. 31, 1922	Dec. 31, 1921
Current and Working Assets:		
Cash in banks and on hand	$27,872,722	$40,057,401
United States Government Bonds	3,950	5,228
Marketable securities	29,618	27,009
Sight drafts against B/L attached and C.O.D.	13,179,664	4,677,241
Notes receivable	4,455,042	4,794,978
Accounts receivable and trade acceptances, less reserve for doubtful accounts (in 1922, $1,431,143.55; in 1921, $1,078,772.26)	15,921,934	17,866,071
Inventories at cost or market, whichever is lower	117,417,823	108,762,625
Prepaid expenses	1,358,404	1,944,988
Total Current and Working Assets	$180,239,157	$178,135,541
	Dec. 31, 1922	Dec. 31, 1921
Current Liabilities:		
Accounts payable	$34,812,441	$15,640,429
Notes payable	.....	48,974,996
Taxes, payrolls and sundries accrued not due	16,166,563	15,894,778
Federal taxes	1,650,821	.....
Accrued dividends on preferred and debenture stock, payable February 1	1,133,096	1,043,763
Total Current Liabilities	$53,762,923	$81,553,967

Heavy Duty Trucks Gaining in Indiana

INDIANAPOLIS, March 20—The two, three-and-a-half and five-ton trucks have come back in Indiana and in all this region. Every dealer and distributor of larger sized trucks reports that business has not been better in three years. Fully double the sales of last spring and most of them for much larger units is the report of almost every merchandiser in this city. Fleet sales have begun, and the increase in building operations and in construction contracts and road work is keeping every distributor and dealer in the section busy.

One distributor reports that last year his sales of one-ton units made up 60 per cent of his business. Now it is the other way around, and the two, three-and-a-half and five-ton vehicles are the sizes in demand.

A considerable part of the demand is for replacement, but there is also an increase in the size of fleets and in the number of new buyers. Demand for dump trucks has grown stronger, due to replacement, new business and the fact that a year ago almost 100 of these types, repossessed by finance companies, were sent out of this city because there was little demand for them here at that time.

There has also been a spurt in chassis sales for bus use in the last ten days, and popular chassis for bus work are in great demand. The light delivery types of commercial vehicles are holding their own, and fleet orders for such types are increasing.

Ford Output Exceeds 250,000 in 2 Months

More Than Two and One-Half Times Greater Than Total in 1922 Period

DETROIT, March 19—Production of 130,577 cars and trucks in February brought the Ford Motor Co. mark for the first two months of the year above the quarter million mark. This figure is in excess of any similar period in the company's history and is two and one-half times the output in the two months of 1922, which totaled 99,722.

The Kearny, N. J., plant led all others in February output with 12,077. Detroit was second with 9932 and Philadelphia third with 6741. The Canadian plant built 6582 and the totals in the foreign plants are as follows: Manchester, 2500; Buenos Aires, 2199; Copenhagen, 1343; Bordeaux, 993; Sao Paulo, 513, and Cadiz, 25.

Tractor production in February was 7908, four times the total in February last year. For the two months the total is 15,812 as compared with 1921 in the corresponding period a year ago. Tractor business is taken by the company to indicate the highly improved agricultural position throughout the country. March production of 10,000 will be less than orders received.

New Daily Record Established

DETROIT, March 20—Planning on an April production of more than 6000 cars and trucks a day, the Ford Motor Co. yesterday established a new daily production record by turning out 5759 vehicles, which is sixty more than the previous best mark of 5699, established Aug. 29, last year.

Kelsey Wheel Co. Earned $16.23 Share Last Year

DETROIT, March 19—The annual report of the Kelsey Wheel Co. shows net sales of $16,938,924 for the year ended Dec. 31, 1922, as against $17,487,598 in 1921. Net profits after all charges including taxes, were $1,801,512, which, after allowing for regular dividends on the preferred stock, was equivalent to $16.23 a share earned on the $10,000,000 capital common stock of $100 a share par value outstanding. In 1921 the company reported net profits of $1,792,861.

The general balance sheet showed net current assets of $5,206,910 and net current liabilities of $505,153.

Current assets included inventory at $2,396,183; notes and accounts receivable, less reserves for bad accounts, $1,524,848; insurance policies, $22,759; government securities, $200,000, and cash on hand $1,063,118.

Current liabilities included $167,876 accounts payable; $62,276 accrued payroll accounts and $275,000 reserves for taxes. The profit and loss surplus at the close of 1922 amounted to $7,811,150 as against $6,786,300 at the end of 1921.

WINTON CELEBRATES FIRST CAR DELIVERY

CLEVELAND, March 19—The Winton Co. is celebrating the twenty-fifth anniversary of what is claimed to be the first order placed for the delivery of an American car to an American purchaser.

On March 24, 1898, Robert Allison of Port Carbon, Pa., placed an order with Alexander Winton for a Winton car which was delivered April 1, 1898. Winton production that year was twenty-one cars.

The Winton Co. is commemorating the event by staging a national sales contest among its dealers this week.

Fisher Body Completes Factory at Janesville

JANESVILLE, WIS., March 19—The new branch plant established here by the Fisher Body Corp. in conjunction with the new plant of the Chevrolet division of General Motors, is completed, and between seventy-five and 100 men are now employed. The initial operations of the Chevrolet plant started late in February.

For the time being the Fisher plant is engaged mainly in painting processes on made-up bodies sent to that point from the Cleveland and Detroit plants, but the construction of bodies will be undertaken as quickly as the machinery is installed. Jobs now going through the Janesville plant painting and trimming department are all enclosed types.

Roadster and phaeton cars being assembled by the Chevrolet plant are being fitted with completed bodies shipped in from the outside Fisher plants.

American Steam Motor to Add to Plant Room

ELGIN, ILL., March 19—Officials of the American Steam Motor Co., successor to the American Steam Truck Co., announce that contracts have been let for the erection of an addition to the main building to be utilized for assembling steam passenger cars and also for storage purposes.

There will be 40,000 additional square feet available when the structure is completed. Frank King, factory manager, has charge of the construction.

The Duty Motor Corp., which has been absorbed by the American Motor Co., has officially been dissolved. The stockholders agreed to the transfer of stock, and all of the legal details have been attended to and approved. In a short time it is expected to commence active production of steam-driven motor cars.

In 20 Years Buick Built Million Cars

Production Shows Steady Advance Since Company Was Organized in 1903

DETROIT, March 19—The Buick Motor Co. has turned out its millionth car, a six-cylinder sport touring model known officially as model 55, the completion of the car following production of the millionth engine by less than a month.

In reaching the millionth mark more than seventy chassis models have come and gone, and 175 body models have been developed.

The production story of Buick in five year periods since the organization of the company in 1903 shows the following:

1903 to 1907	6,844
1908 to 1912	87,152
1913 to 1917	343,602
1918 to 1922	534,012

High spots in Buick production in connection with its twentieth anniversary are:

In 1903—the first year of its organization—Buick produced sixteen automobiles with a two-cylinder engine.

In 1907 the first four-cylinder Buick appeared in four body models, all open cars. Two-cylinder cars were also built in 1907 and 1908, during which time they outsold the fours, but in 1909 the sale of fours more than doubled the twos.

In 1911 the first phaeton with four doors appeared, also the first closed car, a limousine.

Six-Cylinder Model in 1914

In 1914 appeared the first Buick six-cylinder car model B-55. It was a five-passenger phaeton. The four outsold it.

In 1916 ten body models were built on the six-cylinder chassis, and there were no Buick fours. There were sold in that year 125,000 Buicks, an increase of 80,000 over the previous year.

In 1917 and 1918 both fours and sixes were built, but in 1919, 1920 and 1921 only sixes. In 1922 the present Buick four was brought out, and the combination of fours and sixes now offered has broken all Buick years.

The biggest year in Buick history was 1922 with 138,000 cars, and this will be exceeded this year. The biggest day in Buick history was Dec. 28, 1922, when more than 12,000 cars were shipped from the Flint and Detroit plants.

TRANSPORT TRUCK DIRECTORS

MOUNT PLEASANT, MICH., March 20—At the annual meeting of the Transport Truck Co., M. A. Holmes, H. E. Chatterton, A. E. Gorham, E. J. McCall, C. E. Hagan, D. A. Warner, Floyd Mitchell, M. F. Brondstetter and M. T. Kenny were elected directors. The meeting also amended the articles of association, changing the common stock to no par value and making the authorized unissued preferred stock convertible stock.

Prize Winning Essay Tells Value of Shows

C. H. Wills Special Representative Submits Best Paper in N. A. C. C. Contest

NEW YORK, March 19—Of the several thousand persons who submitted essays in the contest inaugurated in December by the National Automobile Chamber of Commerce to bring out the value of national automobile shows to the public, the manufacturer of motor cars and the individual, the best paper was written by E. Phil Merrill, special sales representative of C. H. Wills & Co., Marysville, Mich.

The next best papers were prepared by W. W. Hodge, formerly connected with Hodge Bros., motor transportation engineers of Worcester, Mass., and Charles Alma Byers of Los Angeles. The awards were made by S. A. Miles, Harry Meixell, H. R. Cobleigh and John C. Long, all executives of the N. A. C. C. In each case the prize was a watch.

Value of Shows to Public

As Merrill summarizes the questions, the value of the national shows to the public is as follows:

First: Educational, learning about their own car or improvements made on different cars.

Second: Opportunity for comparative values under one roof, which means time and effort saved.

Third: Benefit from competition, in raising the standards of design, workmanship, materials and performance of the cars.

Fourth: Meeting factory representatives and the opportunity of taking up personally any grievance or trouble.

Fifth: Interchange of experience and service among owners.

Sixth: To provide everyone with a wholesome and beneficial entertainment.

How Manufacturer Benefits

The value of shows to the manufacturer is summed up as follows:

First: Educational to study the trend of the industry and to educate his organization, both factory and field.

Second: Incentive to improve his product by comparative display. To raise the standard of his product.

Third: To sense the demand of the public, and keep his business on a profitable basis.

Fourth: To feel the pulse of the trade from contact with others in the industry.

Fifth: To provide means for expansion by increasing his organization in the field, in obtaining new distributors and dealers.

Sixth: To increase the confidence and enthusiasm of his entire organization, both factory and field, as well as the public.

Seventh: To improve his business methods toward the public, both sales and service.

Eighth: To gain publicity, practically country and to some extent world wide, and thus increase his clientele.

Ninth: To actually sell cars to new prospects and assist his distributors and dealers in making sales.

As to the value of shows to himself, Merrill, who is well known in all parts of the country through his lectures on Wills Sainte Claire construction features at automobile shows, writes:

First: Educational, to learn about improvements and advancements made in the industry.

Second: To improve my salesmanship and increase my value to my company as well as to myself.

Third: To receive a yearly supply of inspiration and enthusiasm and confidence in our product.

Fourth: To help my company and the industry in upholding its reputation and standing by my conduct toward the public.

Fifth: To broaden my acquaintance with the big men of the industry and improve my opportunities.

Sixth: To meet the public and obtain a better idea of its requirements and experiences.

Overland Opens School to Obtain Labor Supply

TOLEDO, March 21—The Willys-Overland Co. has started a training school for skilled and semi-skilled workers in efforts to supply men to take care of increased manufacturing schedules at the local plant.

There are now about 11,000 men at work and it is necessary that the force be increased by nearly 50 per cent within the next few weeks.

Many of the unskilled workers are being trained to take specialized jobs through the new school.

Production at the plant will reach 50,000 cars by the first week in April, according to estimates of officials, which is more than half the total production of last year.

Hupp Heat Treating Plant Will Be Built at Jackson

DETROIT, March 16—Hupp Motor Car Corp. will erect a modern heat treating plant at the factory of its subsidiary, the American Gear & Manufacturing Co., Jackson, where it will conduct all heat treating work formerly done by outside manufacturers and, on a limited scale, at the Jackson plant.

Practically all of the work in the new plant will be done by machinery, making unnecessary any large additions to the force of workmen. The new building will be 75 by 125 ft. and construction will be started at once.

Rubber Officials Buy Plant of Biltwell Tire

AKRON, March 19—The Northern Rubber Co. was incorporated today for $450,000 by L. J. Schott, former president of the Amazon Rubber Co., and R. W. Kent, former vice-president and Canton manager of the Republic Rubber Co.

The new company has purchased the plant of the defunct Biltwell Tire Co. for $200,000. The plant is fully equipped and will be in production in two weeks. Its capacity is placed at 600 tires and tubes daily.

New England Offers Good Sales Outlook

Evidence Is Presented at Boston Show That There Is Good Market for Cars

BOSTON, March 19—Despite adverse weather conditions, dealers exhibiting at the annual automobile show in this city which has just closed report a good volume of business and a sufficient number of prospects to insure sales of all cars that can be obtained from the factories in the next few months.

Attendance during the early part of the week did not come up to other years, but Thursday established a new record with 41,000 people passing through the gates. Exhibitors report that a number of the visitors came more than once and that in a majority of cases these people bought cars.

Two factors were instrumental in retarding sales at the show. One of these was the tax law, whereby all owners of cars purchased before April 1 have to pay taxes on personal property. When Tax Commissioner Long announced that he would check up registration lists and compel cities and towns to collect taxes, some motorists sold their old cars and are holding off buying new ones until after the first of April.

Used Cars a Factor

Another factor was the disposition on the part of some car owners to sell their old cars before they buy new ones. They feel that they may be able to get more by selling the cars themselves than by turning them over to dealers, now that there is a standard appraisal value for used cars to which the distributors live up to in this city.

There were a number of factory representatives here who went home with orders. They know that there will be no need to worry about New England sales for some months to come, if at all. The distributors and dealers certainly do not intend to worry, except for shipments.

Factory representatives in their talks at dealer meetings spoke of the mounting costs of production and the difficulties in getting materials. They did not say outright that prices would be raised, but it was evident that not many of them had any idea of reducing them.

Reeves Addresses Dealers

One of the most important events held in connection with the show was the meeting of dealers at which Alfred Reeves, general manager of the National Automobile Chamber of Commerce, presented statistics on the possibilities of sales in New England. There were 300 dealers in attendance.

Encouraging reports were made by the exhibitors of commercial vehicles and accessories.

During the show many new dealers were signed up for small territories that up to this time had not been covered.

6044 Cars Shipped Abroad in January

Trucks from U. S. Numbered 1721 and Parts Exported Reached Value of $4,421,477

WASHINGTON, March 17—The exports of automotive products from the United States during January consisted of 6044 passenger cars, 1721 motor trucks and parts to the value of $4,421,477. This announcement was made here today by the Automotive Division of the Bureau of Foreign and Domestic Commerce, which had previously given out the shipments from Canada for the same month as being 4666 passenger cars and 369 motor trucks.

Changes in Classifications

Slight changes, principally affecting parts and unit assemblies, were shown in the classifications. Previously, the department grouped under one heading parts, equipment and unit assemblies, the classification being "parts, except engines and tires." This heading has been continued but a classification labelled "automobile unit assemblies" has been added. For January, the shipments coming under it totaled 242,765 pounds, with a value of $56,356. The shipments of "parts, except engines and tires," totaled $4,365,121.

The statement just issued shows that the American export trade is continuing into the new year at substantially the volume reached during the latter part of 1922. The January shipments of both cars and trucks were slightly lower than in December but the difference is explained as being seasonal to a large extent.

The exports of parts, however, showed a remarkable advance during January, from the $3,417,131 of December and were the largest of any month since 1920. Motorcycle shipments also made a gain in January, mounting from 1437 in December to 1713. Details of the statement are given in the adjoining table, which shows that the major items were shipped abroad at double or triple the volume of January, 1922.

Australia maintained its position as the leading market for passenger cars. Canada as a leading market advanced from sixth place in December to second in January. Cuba advanced from ninth place to third. The Cuban automotive imports show a steady increase for the past few months, the 462 cars shipped to that country in January from the United States being the largest since the depression set in in 1920.

United Kingdom Advances

Mexico dropped from second to fourth place, while the United Kingdom advanced from tenth to fifth. The unit value of both passenger cars and trucks showed an increase over the previous month. Belgium, Spain and Australia maintained their respective positions as the three leading truck markets.

Taxicab Advertising Hits Car Ownership

Says That Manufacturers of Automobiles Will Not Appreciate Statements

CHICAGO, March 17—The newspaper advertising campaign being conducted by the Yellow Cab Manufacturing Co. to extend the use of cabs by the public in Chicago, has taken the turn of a direct attack upon individual ownership of cars. Advertisements printed this week declare that transportation can be obtained by the use of cabs at much less cost than by the use of an individually owned car.

One of the ads contains these paragraphs:

Eight years ago many people bought automobiles because they needed quick transportation, and they couldn't trust the cab business, which had hit the bottomless pit of disrepute.

Today vast numbers are NOT buying automobiles because Yellow Cab has solved their transportation problems for them, and because they know they can trust it.

More than that, many big corporations are giving up their own cars which they use for their officials and employees, and are using Yellow Cabs because they get quicker and safer transportation at far less cost.

Manufacturers of automobiles will not appreciate this kind of advertising, but it is a fact just the same. And this kind of business is growing with leaps and bounds. Figure it out, if you have a car of your own.

Table That Shows Shipments of Products of the Automotive Industry from the United States in January, 1923, and the Total Exports That Were Made in Seven Months

	Month of January				Seven Months Ending January 31			
	1922		1923		1922		1923	
	No.	Value	No.	Value	No.	Value	No.	Value
Automobiles, including chassis	2,897	$2,528,292	7,428	$5,356,487	19,332	$17,544,094	50,088	$37,243,910
Electric trucks and passenger cars	24	40,109	32	36,242b	24b	40,109	201	253,134
Motor trucks and buses, except electric	....	....	....	....a	2,727a	2,851,223	....	....
Up to 1 ton	333	221,472	1,095	353,797b	333b	221,472	6,067	2,257,561
Over 1 and up to 2½ ton	100	171,701	205	266,264b	100b	171,701	1,634	1,940,976
Over 2½ ton	22	59,595	52	120,636b	22b	59,595	393	1,141,274
Total motor trucks and buses, except electric	455	452,768	1,352	740,697	3,182	3,303,991	8,094	5,339,811
PASSENGER CARS								
Passenger cars, except electric (F)	....	....	....	....	13,708a	12,164,579a	....	....
Value up to $500 inclusive	....	....	2,099	664,237	....	....b	2,099b	664,237
Value up to $800 (e)	1,331	691,506	1,825	1,321,798b	1,331b	691,605	24,424	12,450,945
Value over $800 and up to $2,000	1,004	1,064,879	1,916	1,996,626b	1,004b	1,064,879b	14,031	15,075,515
Value over $2,000	83	279,030	204	596,887b	83b	279,030	1,239	3,460,268
Total passenger cars, except electric (F)	2,418	2,035,415	6,044	4,579,548	16,146	14,199,994	41,793	31,650,965
PARTS, ETC.								
Parts, except engines and tires (H)	7,935,239	2,060,684	....	....	....	16,303,231c	79,315,812	18,618,812
Automobile unit assemblies (H)	....	....	242,765	56,356	....	....b	242,765b	56,356
Accessories, parts of (H)	....	....	22,103,613	4,365,121	....	....b	262,103,613b	4,365,121
Station and warehouse motor trucks	6	7,590	10	14,042	69	76,749	64	59,863
Trailers	33	21,003	108	18,935b	33b	21,003	311	127,652
Airplanes	1	5,000	12	203,010	19	126,165	24	329,810
Parts of airplanes, except engines and tires (H)	47,374	11,479	3,974	18,885	....	57,958	354,364	217,405
BICYCLES, ETC.								
Bicycles and tricycles	669	9,460	889	10,721	....	424,719	10,399	88,881
Motor cycles	1,010	284,883	1,713	391,561	4,064	1,127,415	9,221	2,182,150
Parts, except tires (H)	229,918	131,677	257,233	121,068b	229,918b	131,677	1,466,577	780,141
Internal combustion, stationary (G)	2,427	270,623	2,197	288,836	8,042	1,420,928	17,135	2,231,072
Traction engines (steam) except agricultural	....	....	17	6,733	....	....	17	6,733
Automobile engines	1,182	143,397	1,036	153,481	5,417	877,069c	16,655b	145,319
Aircraft engines	3	5,275	5	1,200	3b	5,275	62	25,690

a—July 1 to Dec. 31, 1921. b—Jan. 1 to Jan. 31. c—July 1 to Dec. 31, 1922. e—Includes cars valued up to $800 prior to Jan. 1, 1922. F—Includes electric prior to Jan. 1, 1922. G—In this classification is included stationary and portable engines; Diesel and semi-Diesel; other stationary. H—Pounds.

Men of the Industry and What They Are Doing

E. D. Gibbs Resigns

E. D. Gibbs has resigned as advertising director of the B. F. Goodrich Co., effective April 1, to open a New York office as special advertising and sales counsellor. Formerly he served as advertising manager of the National Cash Register Co., and president of the Associated Advertising Clubs of the World. No successor has been announced by Goodrich.

Smith in Charge of Syra-Cord

Harold O. Smith, one of the organizers of the Indianapolis Rubber Co. and the G. & J. Tire Co. of Indianapolis and for many years president of these concerns has been placed in charge of the plant of the Syra-Cord Tire & Rubber Co., Syracuse, N. Y. Smith is chairman of the executive committee and announced that additional machinery is to be installed at once in order to increase production at the plant, which was recently purchased by the creditors of the defunct Syracuse Rubber Co.

Graham Made Chandler Director

George M. Graham, vice-president of the Chandler Motor Car Co., in charge of sales, service and advertising, has been elected a director of the company.

Blood Assistant to Sloan

Howard E. Blood, general manager of the Canadian Products, Ltd., division of General Motors, has been appointed assistant to A. P. Sloan, Jr., vice-president in charge of operations of the corporation. Blood became connected with General Motors in 1919 after leaving military service. He will be succeeded as head of the Canadian plant by Arthur Cash, formerly general manager of the Northway Motors division.

Mooney Returns Home March 27

J. D. Mooney, vice-president of the General Motors Corp. and president of the General Motors Export Corp., will return to New York on the S. S. Majestic, on March 27, after a two months trip abroad, during which he visited England and several of the countries of Northern Europe. Plans for a large business in England have been made by Mooney. Accompanying Mooney on his trip were other G. M. C. officials.

Schomburg with Bingham Stamping

William H. Schomburg, for seven years production manager of the Toledo Machine & Tool Co., has resigned to become works manager of the Bingham Stamping & Tool Co.

Scott with Whitman & Barnes

Harry T. Scott, formerly sales manager of the Detroit Twist Drill Co., has resigned to become New England representative of the Whitman & Barnes Manufacturing Co. His headquarters will be in Hartford, Conn. Scott is a New Englander by birth and spent the early years of his business career with several New England manufacturers in both the mechanical and sales departments.

Brown on Lumber Committee

R. E. Brown of the Fisher Body Corp. has been appointed to represent the Society of Automotive Engineers on the consulting committee of the Lumber Standardization Conference. The committee, in conjunction with the leaders in the lumber industry, is working with the Department of Commerce and the Federal Bureau of Simplified Practices for the standardization of sizes and grades in lumber.

Biss Assists Clough

W. A. Biss, Jr., has been appointed assistant sales manager in charge of advertising of the Winton Co. Biss was associated with C. Roy Clough, sales manager of Winton, when the latter served as sales head for Stephens.

Jacoby Joins National

Kelly R. Jacoby, former sales manager of the Earl Motor Co., has rejoined his old chief, Clarence T. Earl, and has been appointed assistant sales manager of the National Motors Corp.

Bonner Touring South

D. Henry Bonner, general sales manager of the Gray Motor Co., is making a personal survey of business conditions in the Southern States and in the course of his trip will visit the large distributors of Gray cars in that section. Several dealer meetings will be addressed by Bonner, who will close contracts in a number of important cities in which the Gray is not now represented.

Lewis and Ryan Vice-Presidents

C. R. Lewis, formerly general sales manager, and Laurence C. Ryan, treasurer, have been appointed vice-presidents of the Standard Forgings Co. of Chicago.

Agnelli for Italian Senate

By a decree signed by the King of Italy, Signor Agnelli, president of the Fiat Automobile Co. of Turin, Italy, has been nominated a member of the Italian Senate. Agnelli is one of the founders of the Fiat company, now the biggest concern of its kind in Europe, and is recognized as one of the leaders of industry in Italy. This nomination comes on the top of that of Arturo Mercanti, general manager of the Monza Automobile Speedway, to the position of undersecretary for aviation in the Mussolini government.

Heads of Transport Committees Chosen

Swayne Chairman of Body That Will Represent Industry in Proposed Survey

WASHINGTON, March 22—A. H. Swayne, vice-president of the General Motors Corp., has been appointed chairman of the committee on Relations of Highways and Motor Transport to Other Transportation Agencies which will represent the automotive industry in the general transportation survey, to be conducted under the auspices of the Chamber of Commerce of the United States.

The initial meeting of the committee was held in New York, Monday, and a tentative program was formulated. The first working session of this committee will be held here next week.

Representatives of various transportation organizations which attended the preliminary sessions agreed that there is a great opportunity for useful results by closer cooperation of various agencies and through a better understanding on the part of all concerned regarding the situation and the needs of national transportation.

Successful Outcome Expected

Motor truck operators, railway executives, waterway interests, producers, shippers and consumers, all feel that they will be able to work out practical steps of cooperation which will lead to a sound and rapid improvement of the transportation system.

Carl R. Gray, president of the Union Pacific Railroad and chairman of the transportation and communication department of the chamber, has been selected chairman of the committee on railroad consolidations. W. L. Clause, chairman of the board of the Pittsburgh Plate Glass Co., is the chairman of the committee on Development of Waterways and Relation of Rail and Waterway Services.

George A. Post is chairman of the committee on Government Relations to Transportation, and Fred Delano of Washington is chairman of the committee on Readjustment of Relative Freight Rate Schedules. The data provided by these special committees will be the basis of the study to be made by the transportation conference itself.

Metal Trades Elects Beaver

Harry C. Beaver, treasurer of Rolls-Royce of America, Inc., was elected vice-president of the western Massachusetts branch of the National Metal Trades Association at its annual meeting in Springfield, Mass.

G.M.C. Gives Review of Last Four Years

Annual Report Tells of Troubles Due to Big Inventory and Other Causes

(*Continued from page* 689)

gram or to delay in receiving the proceeds of financing. It is quite certain that the funds provided before the close of the year 1920 were sufficient to carry out the whole program and also to finance new business offered during the year 1921 and the first half of the year 1922.

It is equally certain that disregard for control of inventories and purchase commitments cost the corporation a very large sum of money, of which the greater part might have been saved by proper safeguards in divisions now differently managed. Further, it is important to the stockholders to know that the financial misfortunes of the corporation in the past were only slightly related to the manufacture and sale of its products, but that these misfortunes were directly related to loose and uncontrolled methods which now are corrected.

Tractor Division Losses

Commenting on the tractor liquidation, the report said:

After the tractor was fully developed and priced at $650, it was found that it could not be marketed profitably. Prices were raised only to discover that sales could not be made in competition with more cheaply designed tractors. In the meantime commitments for materials had been entered into, with a view to producing 70,000 tractors of this class; and, in addition, materials for producing 60,000 tractors of another class.

This was the situation as it appeared Dec. 1, 1920. The loss in liquidating inventories and commitments of this division amounted to $21,293,752, in addition to the operating losses of $11,946,292, making a total loss incurred of $33,240,044.

The financial section of the report shows that after all charges, including a deduction of $4,555,796 to cover prior year losses in excess of reserves, surplus available for dividends was $51,496,136. The regular dividends on the preferred and debenture stocks required $6,429,228; there remained $45,066,908, equivalent to $2.19 a share on the 20,557,750 shares of no par value common stock. After the payment of a special dividend of fifty cents a share on the common, there was carried to surplus account $34,889,791.

Excess of Current Assets

The excess of current assets over current liabilities Dec. 31, 1922, was $126,476,237, as compared with $96,581,578 Dec. 31, 1921. Cash in bank was $27,872,723; sight drafts, $13,179,664; inventories of materials, $117,417,823. Current liabilities include accounts payable $34,812,441, as compared with $15,640,429 Dec. 31, 1921.

Fixed assets included $57,293,864 in investments in allied and accessory companies; $3,275,432 in General Motors Corp. common and debenture stock held in the treasury; $255,207,970 in real estate, plants and equipment; $3,947,794 in deferred expenses and $22,370,811 in good will, patents, copyrights, etc.

The corporation has allowed $50,827,907 for depreciation of real estate, plants and equipment; $1,143,962 for the employees' investment fund; $7,016,667 for sundry contingencies and $1,344,098 for bonus to employees, a grand total of $60,332,635. The total capital stock outstanding is valued at $314,744,200.

Body Maker Evolves Plan to Reduce Freight Costs

NEW YORK, March 21—Arthur H. Wolfe, vice-president of the Springfield Body Corp., has evolved a plan which he claims, in the case of points along the North Atlantic Seaboard, will cut freight rates on bodies two-thirds.

In outlining his plan, Wolfe says:

The first essential is to locate body building factories in proximity to large centers of population. The next is to ship chassis roughly crated, with wheels, fenders and steering post removed, to these plants. Twelve or more of these chassis may be loaded in one of the large box cars used by the railroads to transport automobiles. The average freight charge per chassis from the Middle West to the North Atlantic seaboard will be $12, against $45 for a complete car, figuring that the railroad box car will carry three complete automobiles.

The company has two plants at present, one located at Springfield, Mass., and the other at Bloomfield, N. J., convenient to Boston, New York and Philadelphia and contiguous territory. It is stated that the annual output of these plants will be 20,000 bodies, the saving of $33 on each body aggregating $660,000. The company also claims that through its plan it will be able to save on export shipments through the proximity of its New Jersey plant to sea ports.

Tire Makers Will Study Conditions with Dealers

NEW YORK, March 20—The Rubber Association of America, through the tire manufacturers' division, is about to undertake a study of costs, turnover and kindred subjects having to do with profits and losses in the tire field. In this work the association will have the cooperation of the Harvard Bureau of Business Administration, which has conducted similar investigations in various other mercantile fields.

The first step in the survey will be a preliminary questionnaire to be sent to 25,000 dealers to obtain information on which will be based the final plan of the campaign.

The manufacturers hope, by gathering and disseminating information on dealer costs and operating methods, to be able to lay before dealers information which will assist them in making their businesses more profitable. It is hoped that the survey will result in suggestions for business methods which will generally improve merchandising conditions in the entire industry.

British Labor Wants Higher Duty on Cars

Claims That Competition with American Products is Cause of Unemployment

LONDON, March 17 (*by cable*)—A higher tariff on American built automobiles is being urged on the House of Commons by workmen employed in various motor car producing factories in England, on the grounds that they are being thrown out of employment by competition in the local market with the low-priced American product.

Three petitions, each bearing several hundred signatures, have already been sent members of the House of Commons. They set forth that because of large imports of American made cars British manufacturers have had to discharge large forces of their men, or have put them on short time, in order to curtail expenses. The higher tariff is seen as a remedy.

The petitions that have been presented are from the J. E. H. Hall's works, Dartford, containing 650 signatures; Austin's works, Birmingham, 500, and the Tilling-Stevens works, Maidstone, 430.

British automobile manufacturers deny that they have initiated the petitions, or that they are urging their men to make them, but that the petitions are being circulated by the men in order that they may secure steady and certain employment.

Conference to Be Called

BIRMINGHAM, March 17 (*by cable*)—The National Unions of Manufacturers Midland Council of Birmingham have voted to call a meeting of motor car manufacturers of Great Britain to discuss the question of making representations to the government with a view to raising the import duty upon foreign cars.

The date for the general meeting has not been set.

Hendee, Back to Normal, Will Increase Schedule

SPRINGFIELD, MASS., March 20—Production at the Hendee Manufacturing Co. is said to be practically normal. More than 1000 cycles will be turned out this month, and the schedule calls for a considerably larger number next month.

Since the New York show, which yielded the company the best results of any show in its history, orders have been received in increased volume from both eastern and western areas. W. G. McCann, export manager, has just returned from three months in Europe, during which he visited nearly every country on the continent. He brings back an optimistic report as regards trade prospects.

62 Jordans Shipped Daily; More in April

Report Made at Annual Meeting When Officers and Directors Are Re-elected

CLEVELAND, March 21—At the annual meeting of the Jordan Motor Car Co., yesterday, announcement was made that shipments at present are running at the rate of sixty-two cars a day. This number will be increased to seventy-five cars daily in April, according to Secretary Paul Zens, who presided at the meeting in the absence from the city of President E. S. Jordan.

Earlier in the year the Jordan company doubled the production capacity of its plant through the installation of a chain conveyor system. It was said that while the new arrangement gives the plant a capacity of eighty cars a day the schedule for the year would be figured on a basis of forty cars a day or 12,000 per annum.

Jordan produced in excess of 1800 cars in January and February and is proceeding at the rate of 1500 cars this month. If the April schedule calling for about 1900 cars is carried through, the company will have produced about 5200 cars in the first four months as against approximately 8000 cars in all of 1922.

Officers and directors re-elected were: Edward S. Jordan, president; C. L. Bradley, vice-president; Paul Zens, secretary and treasurer, and Otto Miller, T. E. Borton, Russell S. Begg and W. R. Riley directors.

Production of Casings Increased in January

NEW YORK, March 17—Production of pneumatic casings, inner tubes and solid tires in January of this year showed an increase over last December and January of 1922, according to the figures compiled by the Rubber Association of America for the Bureau of Foreign and Domestic Commerce.

A comparative table of inventory and production shipment is as follows:—

PNEUMATIC CASINGS

1922—	No. Mfrs. Reporting	Inventory	Production	Shipments
Jan.	66	4,174,216	2,055,134	1,596,806
Feb.	66	4,691,329	2,084,308	1,562,365
Mar.	63	5,183,286	2,645,790	2,073,963
April	65	5,464,336	2,401,187	2,086,651
May	65	5,523,095	2,721,503	2,639,273
June	64	5,042,147	2,838,890	3,133,260
July	63	4,834,106	2,476,636	2,695,095
Aug.	63	4,629,392	2,905,209	3,029,823
Sept.	64	4,612,037	2,504,744	2,502,106
Oct.	64	4,682,958	2,674,662	2,588,770
Nov.	62	4,964,976	2,733,134	2,379,708
Dec.	59	4,599,208	2,656,942	2,934,079
1923—				
Jan.	62	4,695,916	3,127,270	2,994,297

INNER TUBES

1922—	No. Mfrs. Reporting	Inventory	Production	Shipments
Jan.	66	5,246,647	2,343,393	1,889,724
Feb.	65	6,141,956	2,596,774	1,702,583
Mar.	63	6,991,118	3,017,511	2,090,737
April	65	7,230,096	2,650,573	2,329,343
May	65	7,189,552	2,970,696	2,938,947
June	64	6,186,534	3,130,629	3,973,679
July	63	5,675,839	3,068,199	3,630,744
Aug.	63	5,207,228	3,808,224	4,220,055
Sept.	64	5,164,757	3,501,442	3,558,971
Oct.	64	5,488,033	3,787,758	3,420,680
Nov.	61	6,210,053	3,850,908	3,075,023
Dec.	59	5,732,125	3,411,074	3,825,949
1923—				
Jan.	62	5,838,310	3,951,885	3,748,651

SOLID TIRES

1922—	No. Mfrs. Reporting	Inventory	Production	Shipments
Jan.	11	181,769	40,224	33,294
Feb.	11	183,448	39,492	36,805
Mar.	11	182,197	49,433	48,350
April	11	173,748	46,664	52,309
May	11	170,904	57,640	60,711
June	11	169,808	66,089	63,408
July	11	176,375	71,505	60,425
Aug.	11	189,698	84,313	69,435
Sept.	11	200,016	82,767	66,797
Oct.	11	213,942	85,480	71,275
Nov.	11	234,684	85,775	61,466
Dec.	10	244,061	77,221	64,570
1923—				
Jan.	11	262,462	83,343	60,611

"Production" and "Shipment" figures cover the entire month for which each report is made. "Inventory" is reported as of the last day of each month.

"Inventory" includes tires and tubes constituting domestic stock in factory and in transit to, or at, warehouses, branches (if any) or in possession of dealers on consignment basis, and as a total represents all tires and tubes still owned by manufacturers as domestic stock.

"Shipments" includes only stock forwarded to a purchaser and does not include stock forwarded to a warehouse, branch or on a consignment basis.

Total February Output Amounted to 275,769

WASHINGTON, March 22—Reports received by the Bureau of Census place the total output of trucks and passenger cars in February at 275,769. The output of cars amounted to 254,415 as compared with 223,706 in January. The February truck production reached 21,354 as against 19,376 in January.

With few exceptions reports received by government each month are from identical firms and include approximately 90 passenger car and 80 truck manufacturers.

Additional data received since the publication of January production figures necessitated several revisions. The January total of passenger cars and trucks given above were revised.

In addition, the figures of truck production for the period August to December 1922, were likewise revised.

Revised figures for truck production are as follows:

August	24,466
September	19,212
October	21,512
November	21,683
December	20,050

Southern Lumber Mills Report Shortage of Ash

ATLANTA, March 19—Demand for thick grades of ash from the automobile and body trade since the first of the year has been the heaviest it has been in several years, according to several lumber mill companies having southern headquarters in Atlanta, and operating mills in this district cutting ash.

This heavy demand has increased ash prices the past six weeks, and the tendency is still upward.

Goodyear, Goodrich, Miller Raise Prices

Ten Per Cent Increase Announced in Lists of Pneumatic Automobile Tires

AKRON, March 19—Tire prices were increased today for the second time this year by three of the major companies in the Akron district. Goodyear Tire & Rubber Co., B. F. Goodrich Co. and Miller Rubber Co. all announced 10 per cent price elevations on pneumatic automobile tires, to become effective early next week. Tube prices also are increased, but no change for the time being is made on prices of truck tires.

Practically all other tire companies are expected to join in the price increasing movement which was started a few days ago by the United States Tire Co.

The Goodyear increases average 10 per cent on pneumatic tires and 7½ per cent on tubes, and become effective Monday.

Miller increases tire prices 10 per cent and tube prices from 7 to 10 per cent, also effective Monday. The increases do not affect straight side fabric tires above the 30 x 3½ size.

Goodrich adds 10 per cent to both pneumatic tires and tube prices, effective Tuesday.

The first of the year all tire companies boosted prices from 10 to 12 per cent. This second increase, officials claim, is necessitated by the higher demands of labor in Akron and the steadily increasing cost of crude rubber, which has advanced more than 150 per cent since last November. Miller, Goodyear, Firestone and Goodrich all have given 10 per cent bonuses to their employees.

Other Companies Join Move

AKRON, March 19—The Mohawk Rubber Co., India Tire & Rubber Co., Swinehart Tire & Rubber Co. and American Rubber & Tire Co. today joined the price increasing movement, announcing tire price advances like those of Goodrich, Goodyear and Miller.

No announcement has been made by Seiberling, General or Firestone, although Firestone is expected to increase now. Seiberling is not planning to act until May, it is reported.

Oldsmobile Farm Sales Five Times Above 1922

DETROIT, March 17—Oldsmobile business in farming districts this spring shows an increase of five times that of last year, according to sales figures at the factory. States that are leading in the buying are Nebraska, Montana, North Dakota, South Dakota, Wyoming, Iowa, Kansas, Missouri and Mississippi.

Dealers in these states report business due to good crop prices which have given the farmers surplus funds.

TWO RUBBER ASSOCIATIONS MAY UNITE

Members of Midwest Favor Amalgamating

Question of Joining Larger Organization Raised by Seiberling at Meeting

CLEVELAND, March 20—The Midwest Rubber Manufacturers Association, at its March meeting here yesterday, took steps looking toward amalgamation with the Rubber Association of America. A committee was appointed to ascertain the conditions upon which amalgamation might be effected. The committee was instructed to try to arrange that in case of amalgamation meetings of the western group might continue to be held in Chicago, or some other midwest city, every three months.

An informal vote on the question of amalgamation showed that the membership was almost unanimously in favor of it. Only two out of sixty-five present voted against it. The membership of the Midwest Association is about 150, but more than three-fourths of them are associate members, including firm manufacturers. Most of the larger tire manufacturing members of the Midwest already are members of the Rubber Association of America.

No Need for Two Bodies

The question of joining with the Rubber Association was not on the program for the Midwest meeting. It was injected spontaneously with the appearance before the meeting of Frank A. Seiberling of the Seiberling Rubber Co. Seiberling was called upon to make a talk, and the burden of his talk was that he could see no need for two associations of rubber manufacturers and that the place for the Midwest manufacturers was in the Rubber Association.

The motion to appoint the amalgamation committee was made by Sidney J. Roy of the Hannibal (Mo.) Rubber Co., vice-president of the Midwest. Members of the committee are Roy, W. G. Brown of Cleveland, W. E. Wilson of Akron and W. W. Wuchter of Omaha.

At yesterday's meeting the resignation of Wuchter as president of the association was accepted. He was president last year and recently was reelected, but said that he could not give the time to the office for another year. Thomas Follen, president of the Lion Tire & Rubber Corp. of Lafayette, Ind., was elected to succeed Wuchter.

William B. Hines of the Firestone Tire & Rubber Co. explained the activities of Harvey S. Firestone for the development of new sources of crude rubber on account of the British tax restriction act, and the association endorsed Firestone's effort. Several members of the association indicated that their firms intended to follow the action of larger manufacturers in increasing tire prices.

MILEAGE WILL SELL CAR, SAYS KETTERING

TOLEDO, March 20—That the automobile which cannot run 50 miles on a gallon of gasoline will be unsalable in four years was the prediction made by C. F. Kettering, president of the General Motors Research Corp. before the 400 members of the factory management class of the University of Toledo and guests at the annual banquet of the class held here.

Factory Production Big as Month Moves Forward

(*Continued from page* 686)

loadings generally are reported. Finished products, for this reason, are not being delivered with the expedition demand warrants.

The steel supply constitutes a big question with manufacturers, premiums being necessary to insure immediate delivery. With the greater demand, producers are reporting strained facilities to cope with it. Stocks in manufacturers' bins are low except in cases where early quantity buying contemplated such a condition as now exists.

Unit and parts makers are operating at capacity in line with the general activity in other automotive branches and some report the probability of top-speed production extending into the summer. The present indication is that plants will have all the business they can handle up to July 1, at least.

AMERICAN TIRE AT CAPACITY

AKRON, March 20—The American Rubber & Tire Co. has completed reorganization of its official personnel and is now producing up to capacity with a daily output of 1000 tires. Fred H. Snyder remains as president under the reorganization with his son, Floyd C. Snyder, in the capacity of vice-president and actively in charge of the company's affairs. Thomas J. Johnson, formerly with the Howe Rubber Co. of New Brunswick, N. J., becomes factory manager and Henry L. Houk remains as secretary and treasurer.

De Lisser Answers Winston Churchill

Warns That All Industry Will Suffer from British Restriction Act

NEW YORK, March 21—Horace De Lisser, president of the Rubber Association of America, in an announcement of the acceptance by Herbert Hoover, Secretary of Commerce, of his association's cooperation in the rubber survey the Government is making, also answers Winston Churchill, former Colonial Secretary of Great Britain, and at the same time warns of a threatened crisis in the American industry because of the Stevenson restriction act.

De Lisser says that the association which he represents is convinced that the British policy threatens not only the rubber industry here but throughout the world. The Stevenson plan, he thinks, threatens to introduce wild speculation in rubber prices, and that its ultimate effect will be to curtail rubber production on the plantations, which would be ruinous to the rubber growers.

"This association," he says, "believes that the policy of the British Colonies today will be far more injurious to the plantations than to the rubber industry in this country."

Car Owners to Receive Book on Care of Tires

NEW YORK, March 21—A 20-page book on "The Care of Tires," soon to be distributed to automobile owners through the medium of tire manufacturers and dealers, marks the second phase of a campaign undertaken by the tire manufacturers division of the Rubber Association of America to lengthen the life of tires.

The association has already issued to dealers two posters dealing with the standard warranty.

The book, which will run into millions of copies with the hope of reaching a large majority of the motorists of the country, takes up the care of tires in detailed text and illustrations under the subjects of Inflation, Pressure, Overloading, Oversize, Tread Wear, Neglected Tread Cuts, Side Wall Wear, Rims and Tubes. The book is concluded with the statement of the Standard Tire Warranty and its advantages for tire users.

It is the aim of the association, through its educational campaign, to help car owners to get more mileage out of their tires, thus reducing costs to them and at the same time cutting down the losses sustained by manufacturers and dealers in making adjustments.

RAIL CARS AN ECONOMY, SAYS CAIN

Short Line Official Favors Having Them

Declares They Should Prove as Successful as Buses and Trucks on Highways

CHICAGO, March 21—"A majority of the short line railroads in the United States could change deficits to profits by substituting gasoline motor cars for steam trains," said J. W. Cain, purchasing agent for the American Short Line Railroad Association and president of the recently organized Railway Motor Finance Corp., in an interview here today.

Cain stated that a year ago a committee of which he was chairman recommended to the Short Line association the abandonment of steam trains wherever the volume of traffic was not sufficient to make their operation profitable at the prevailing cost of operation of about sixty-five cents per train mile.

In his interview he pointed out that on some of the lines having large peak loads it would not be practicable to substitute gasoline cars for steam trains, chiefly because gasoline cars of sufficient power and capacity to care for these peak loads have not been developed.

He said that where the maximum number of passengers required to be carried at one load does not exceed fifty, there are gasoline cars which can be depended upon to give satisfactory service, even better than that given by steam trains, at less cost. The recommendation sent out last year named a number of types and makes of cars which have been found satisfactory for this service.

In his recommendation Cain said that motor truck and bus transportation on various kinds of highways had been successful, and he saw no reason why such automotive transportation should not be even more successful on steel rails. The required type, he said, was a light, strong vehicle with highly dependable power, transmission and clutch units. He stated that such cars are now being produced on satisfactory factory schedules and that he believes such equipment will be rapidly added by the Short Lines.

Europe Enters Nine Cars for Race at Indianapolis

PARIS, March 14 (*by mail*)—Jules Goux will be a starter in the next Indianapolis 500-mile race with a Rolland-Pilain car fitted with a non-poppet valve engine. This will bring the number of European contenders up to nine, namely the two Rolland-Pilains driven by Goux and Guyot, the team of four Bugattis, and three German Mercedes cars.

NEW ENGLAND RAILWAY MAKING EXPERIMENT

NORTH ADAMS, MASS., March 29—A gasoline train, said to be the first in New England, will be run soon over the Hoosac Tunnel & Wilmington Railroad as an experiment.

Numerous railway experts and executives will witness the test. A four-wheel gasoline locomotive and two coaches, accommodating seventy passengers, will be included.

Goux's car will be the first to run in the Indianapolis race with other than a poppet valve engine. This power plant has been built by the S. R. O. Ball Bearing Co. of Annecy, France, according to patents held by them on a cuff valve engine. Goux expects to have his cuff valve engine in the Rolland-Pilain chassis within a few days and will carry out road tests in France before coming to America.

Durant in French Grand Prix

LOS ANGELES, March 2—Cliff Durant announces that immediately after the Indianapolis 500-mile race on May 30, he will ship his four cars abroad for the French Grand Prix which will be run at Tours on July 2. This will be the second time an American team has been entered in the French classic.

To Study Contamination of Air by Car Exhaust

NEW YORK, March 20—The New York Academy of Science, through its public health committee, has engaged Professor Handell Henderson, an expert, to study the extent of the contamination of the air of New York City by carbon monoxide from the exhaust of automobiles operating on the streets.

The committee already has started a preliminary investigation which shows, it is said, that at certain periods of the day and in certain areas of the city the concentration of carbon monoxide is such as to warrant some remedial measures.

In a statement issued today the committee says:

The increasing concentration of motor traffic in New York City has resulted in contamination of the air with carbon monoxide in certain sections of the city which has reached the point where it is deleterious to health.

Carbon monoxide constitutes from 7 to 12 per cent of the exhaust gas, depending upon the mixture of the gasoline. It oxidizes very slowly, if at all, and the rate of rapidity of its diffusion in the streets varies with atmospheric conditions and the velocity of the winds.

Couzens Cites Ford as Good Rail Chief

Believes Roads Should Follow His Example in Reducing Operating Costs

WASHINGTON, March 21—Senator James Couzens of Michigan believes that the railroads are planning a big coup while Congress is resting with an idea of paving the way to wage reductions instead of making such improvements in efficiency as will bring about lower freight rates and reduce operating costs.

So strong are his views on this subject that he has issued a lengthy memorandum in which he severely criticizes railroad management and at the same time points out how Henry Ford, with whom he was previously associated, is reducing the cost of operations without lowering wages.

In this statement Couzens says:

There is an immense amount of propaganda even now being circulated in defense of the railroads as now being operated, and there are also demagogues going around the country overstating our railroad difficulties, and with all this it is going to be hard for the patient (the public) to properly determine the kind of medicine or surgical operation they should have to effect the remedy.

Couzens states that instead of cutting wages the railroads should strive for more efficient management and declares that there has been no improvement in locomotive performance for eighteen years. Notwithstanding larger and more powerful locomotives and increased size of trains, the net ton miles per 1000 pounds of tractive effort in 1922 was exactly the same as it was in 1903—260,000, he says.

Chilibiri Sets Record for 91.5 Cu. in. Class

PARIS, March 15 (*by mail*)—A speed of 101.25 m.p.h. for the flying kilometer, average taken in both directions, has been attained by an Italian Chiribiri car of 91.5 cu. in. piston displacement. The car was driven by Deo Chiribiri, son of the builder, the performance being made on the open road and officially timed by delegates of the Automobile Club of Italy. It is claimed that this is a world's record for this class.

The Chiribiri has a four cylinder engine of 2.5 x 4.4 bore and stroke with two valves per cylinder mounted in the head at 45 degrees. Cylinders are steel construction with welded-on jackets. Two carbureters are used, together with a single magneto firing a single plug placed vertically in the cylinder head. Chassis features follow normal practice.

Europe May Exhibit at New York Show

Larger Space in Armory Makes International Character of Display Possible

NEW YORK, March 20—European automobile manufacturers may be invited to participate in the next national automobile show to be held in New York City in January.

The shift from the Grand Central Palace to the Eighth Coast Artillery Armory with its floor space of approximately 175,000 sq. ft., in comparison with 114,000 in the Palace, makes possible the showing of foreign cars in conjunction with those of American make.

Before Samuel A. Miles, show manager for the National Automobile Chamber of Commerce, sailed for Europe last week, he conferred with the N. A. C. C. show committee and was empowered to take up with London and Paris show exhibitors the question of including foreign makes of cars in the Armory show.

Hitherto lack of space has made it impossible for the chamber to give the foreign cars proper representation. In the last show no imported car was displayed, and the year before room could be found only for the Itala and the English Vauxhall. Prior to this Fiat for years was about the only foreign car exhibited, provision being made for it because of the American factory it maintained.

If foreign cars are admitted in the Armory exhibition, the scope of the show will be broadened, and it will become as international in character as the Paris and London exhibitions.

Timken Bearing Earned $6.43 Share Last Year

CANTON, OHIO, March 20—The Timken Roller Bearing Co. reports a net profit of $7,724,029 for 1922. After charges, depreciation and Federal taxes this is equivalent to $6.43 a share earned on the 1,200,000 shares of outstanding capital stock of no par value. The income account for the year follows:

Mfg. profits	$10,925,159
Sell. exp., etc.	1,613,450
Profits	$9,311,709
Other income	443,250
Total income	$9,754,959
Depreciation	930,930
Federal taxes	1,100,000
Net profits	$7,724,029
Preferred divs. (retired)	286,427
Common div. (old)	645,000
Common div. (new)	1,800,000
Surplus	$4,992,602
P. & L. surplus	$10,829,020

PLANS FOR HARLEY FOUNDRY

SPRINGFIELD, MASS., March 20—The Arcade Malleable Iron Co., which is taking over the foundry of the Harley Co. here, probably will not operate it before midsummer, as much preliminary work is said to be necessary, including the building of an extension to accommodate the extra long furnace that will be installed. Castings for automobile parts and other products will be made. It is stated that H. P. Blumenauer will have general management of the Worcester and Springfield plants, which will be run in close coordination.

BANK CREDITS

Written exclusively for AUTOMOTIVE INDUSTRIES *by the Guaranty Trust Co., second largest bank in America.*

Further expansion in the volume of production and trade, rising prices, and growing demands for credit are continuing features of the business situation.

Freight movement as shown by car loadings continues to break all records for this season of the year. For the week ending March 3, loadings were 917,896, or in excess of 85,000 cars more than in the preceding week and 114,000 cars more than for the corresponding week in 1922. Daily consumption of cotton averaged 24,648 bales in February.

The coal and iron output continues strong. The peak of wartime production in steel has been equaled. The improved export demand for steel is due largely to the disturbed conditions in the Ruhr, as the interruption of production of this and kindred products there has stimulated European buying in this country.

The last statement of the Federal Reserve banks showed an increase of $53,000,000 in deposits, accompanied by a decline of $13,000,000 in Federal Reserve note circulation, which, with a further decline in reserves, brought the reserve ratio to 75.4 per cent, as compared with 76.2 per cent a week earlier.

Interest rates on fixed-date maturities stiffened slightly last week, the range for paper running sixty days to six months being 5¼ to 5½ per cent, as compared with a range of 5 to 5¼ per cent in the previous week. This further stiffening of rates is in keeping with the enlarged credit demands incident to the expansion of business activity.

During the last week the Government withdrew $38,000,000 from local depositaries. There has been a slackening in the offering of new capital issues recently, but there is no scarcity of investment funds. The offering of $400,000,000 United States Treasury Certificates of Indebtedness was over-subscribed by more than $100,000,000.

DURANT ENTERS INDIANAPOLIS

INDIANAPOLIS, March 19 — Cliff Durant, who in official time trials on the Los Angeles speedway last Friday broke the world's records for five and ten miles, has entered four Durant Specials in the eleventh annual 500-mile race to be run here Memorial Day. The cars are to be eights, with 2 11-32 in. bore and 3½ inch stroke.

FINANCIAL NOTES

Packard Motor Car Co. reports that with the retirement of all its outstanding bonds on April 15 it will have removed from its balance sheets the remaining effect of the national business slump which started in 1920. The bonds which have been called for retirement are those outstanding from an issue of $10,000,000 due in 1931 and issued on April 15, 1921. With their retirement the company will have outstanding preferred stock of $14,676,200 par value and $23,770,200 par value common stock, including the 100 per cent common stock dividend recently paid. Net earnings of the company will be considerably increased through the removal of the fixed interest charge on the bonds.

Fisher Body Ohio Co.'s sales for the nine months ended Jan. 31, 1923, amounted to $13,493,308, which is at the annual rate of $20,000,000. More than one-half of the sales were made in November, December and January. The net earnings for that quarter were $752,711, or within $15,000 of the year's preferred dividend requirement. This dividend has been reduced from $800,000 to $768,000 by the retirement of 4 per cent of the original issue of $10,000,000 of stock through the sinking fund operation in 1922. The directors have declared the regular quarterly dividend of 2 per cent upon the preferred stock, payable April 1.

Marlin-Rockwell Corp.'s annual report shows net sales of $4,124,610, with gross profits, after deducting manufacturing expenses, of $1,437,090. After crediting other income and deducting interest and other charges, including idle plant expenses, there was reported a loss of $989,899 for the year. The balance sheet as of Dec. 31, 1922, shows net current assets of $2,723,879 and net current liabilities of $2,458,712. The capital surplus is carried at $1,094,643, and the earned surplus at $1,323,962. All assets aggregate $5,999,432.

Curtiss Aeroplane & Motor Corp. reports gross profits of $225,295 from sales for the year ended Dec. 31, 1922. Total income was $340,560. After allowing for selling and other expenses, losses for subsidiary companies, interest, etc., there was a deficit of $155,354. The company started the current year with orders valued at $3,752,009, as against $1,763,224 at the close of 1921.

Rickenbacker Motor Car Co. has been granted authority by the Michigan Securities Commission to increase its capital stock $2,500,000. Application was made on the ground of increased business of the company with consequent expansion of plant and equipment. The application showed that the company had earned 9 per cent on its capitalization last year.

Moon Motor Car Co. will retire the outstanding 3114 shares of preferred stock at $105 a share on March 31. This retirement will leave the company with 180,000 shares of common stock outstanding and no bonds or funded debt. The regular quarterly dividend of 1¾ per cent on preferred stock has been declared.

Peerless Motor & Truck Corp. has declared a dividend of $1 a share on its common stock, payable on March 31 to stockholders of record March 21. The last quarterly payment on this issue was 75 cents.

Goodyear Tire & Rubber Co. has declared an initial quarterly dividend of $2 a share on the prior preference voting trust certificates, payable April 1 to stockholders of record March 20.

Survey Guides Hupp in Its Export Plans

Improved Buying Ability Shown to Be World Wide with Some Exceptions

DETROIT, March 17—Considerably increased markets for American automobiles and other products may be looked for in the three chief South American countries—Argentina, Brazil and Chile, says Charles D. Hastings, president of Hupp Motor Car Corp., following completion of a survey in all leading countries of the world. Aside from the central, eastern and southern nations of Europe, he declares, the survey shows improved buying ability to be worldwide.

These South American countries, especially Argentina and Brazil, have been benefited by better crops and by improved markets for coffee, hides, wool and agricultural products. Steady betterment may be looked for in Chile, he says, and slower improvement in Uruguay.

Export Department Surveyed Field

The survey was made by the export department of the company through its field agents, with particular attention paid to buying power in medium priced automobiles. Bank deposits were found to be increasing, employment greater, exchange more stable, and crop and material prices better. All these factors are combining to make for better conditions, the survey shows, with consequent favorable effect upon export business of every kind.

Australia is in position to take more American commodities than in 1922, Hastings says, and in that year it took a larger percentage of normal volume of imports than any other leading export country except Canada. This is due to the large crop year that has been enjoyed. Conditions in Australian cities and in adjacent markets, of which New Zealand is the largest, also are much improved.

Philippines Improved

Though general domestic business has not improved in South Africa to the same extent as in Australia, there has been a much greater volume of export business and there will be a much larger field for import business. Only a slight improvement is noted in the East and Far East, Hastings says, except in the Philippines, where materially better business should be enjoyed.

Countries in Europe other than those torn by post-war financial and political problems should yield a better volume of business than last year, but the return of real prosperity with them is contingent to a large extent upon the settlement of the entire European situation. Exchange rates are also unfavorable, Hastings states, and this will have the effect of holding back business.

As a result of the survey, Hupp is making definite plans for its export campaign of the year. Business is expected to double that of 1922, in which year the company ran slightly ahead of its fixed export schedule. In the course of the year the company will cultivate extensively the markets nearer home and will also pay particular attention to the market possibilities in the colonial possessions.

INDUSTRIAL NOTES

S. F. Bowser & Co. of Milwaukee, organized under the laws of Wisconsin, has been granted a charter in that state. The authorized capitalization is $6,000,000. The concern of similar title with headquarters at Fort Wayne, Ind., acquired the entire interests of the Richardson-Phenix Co., Milwaukee, about ing fun operation in 1922. The directors have ances, il filters, etc., and since changing two years ago. The Milwaukee company manufactures lubricating devices and appliances, oil filters, etc., and since changing hands has been operated as the Richardson-Phenix division of the Indiana corporation.

Sprague Electric Works of the General Electric Co. has consolidated its district and local offices with corresponding offices of the General Electric Co., effective April 1. The manufacture and exploitation of its products will be continued in the name of the General Electric Co. in the recently organized merchandise department. The Sprague conduit products section and the Sprague apparatus section of the merchandise department for the present will continue offices at 527 West 34th Street, New York City.

Springfield Body Corp. is planning an addition to the West Springfield, Mass., plant to cost $200,000. It will be erected this spring, officials of the company announce, and will add some 200 high-grade bodies a month to the production capacity. It will be adjacent to the present plant.

Paul J. Kraft, formerly a Wheeler & Schebler representative, has been placed in charge of the office which the Stearns Motor Manufacturing Co. of Ludington, Mich., maker of industrial and marine engines, has opened at 3420 McDougal Avenue, Detroit.

Whitman & Barnes Manufacturing Co., will transfer its New York office and warehouse on May 1 from 64 Reade Street to larger quarters at 99 Chambers Street. Frank W. Oliver will continue in charge.

Production Engineering Corp. has been organized to take over the business of the Marvin & Casler Co. of Canastota, N. Y. It will continue the manufacture of Casler tools.

Electric Auto-Lite Co. of Toledo has declared a dividend of $1, payable April 2 to stock of record March 20.

Ambassador From Italy Pays Visit to Detroit

DETROIT, March 16—Henry Ford entertained Prince Don Gelesio Caetani, Italian ambassador to the United States, at his Dearborn offices and the River Rouge tractor plant, on the occasion of the ambassador's visit to Detroit. In an address later at the Board of Commerce the Prince emphasized the importance of American capital to Italy.

METAL MARKETS

With the beginning of the year's second quarter only a few days distant, steel buyers have their ears to the ground with a view to detecting at least some indication to the price trend. The outlook reveals little hope for relief during the coming three months from the market's tendency to harden more and more from day to day. Practically all of the mills' capacity during April is under commitment, and many of the producers have enough of a backlog of orders on their books to enable them to be very fastidious about all second quarter business that may be offered to them. Mills which have relatively much blank space on their order books for May and June shipments are in this position because of their own volition and count themselves fortunate in this because they figure on being enabled thereby to skim the richest cream off the market when opportunity offers.

It may be true, as is frequently pointed out these days, that the tonnage on which premiums are being paid is slight. Nevertheless, the market as a whole is under the influence of these premium transactions. There prevails a wide spread between the prices named by individual producers. The lower prices, however, are generally coupled with inability on the producer's part to accept proffered business. A few days ago it was reported that a tonnage of sheet bars had been allotted for second quarter shipment on a basis of $42, Youngstown. On the heels of this information came a report that a Cleveland producer had sold 10,000 tons of sheet bars, f.o.b. Cleveland mill, at $45, involving $2 per ton more freight than if the basis had been Pittsburgh or Youngstown.

With the market for their semi-finished material as plastic as indicated by the foregoing, non-integrated sheet rollers naturally hesitated when it came to booking second quarter sheet business. Soft steel bars continue to be scarce at any price, and automotive consumers are searching not only in the markets in which they are accustomed to buy, but in others and more distant ones for supplies.

Pig Iron.—Automotive foundries continue to buy conservatively against their second quarter requirements and to sound the market with reference to third quarter iron. Chicago, Cleveland, and even Cincinnati, are booking moderate tonnages for automotive consumption. Production is heavy, and although blast furnace interests look for another heavy buying wave in the near future, consumers are little disposed to commit themselves beyond their normal requirements..

Aluminum.—What aluminum supplies there are in the "outside" market are now being held at prices either on a par with or higher than those of the domestic producer. Shipments afloat from Norway are said to have been absorbed by consumers. The condition of the market here now begins to reflect the generally sold out condition of the world's aluminum industry.

Copper.—Another upward movement in the price of the red metal is apparently to be attempted, recent upward manipulation of London prices being looked upon as a preparatory step. Automotive demand for wrought copper and brass products continues heavy, and reports from the Waterbury district are that some orders have been booked for long-deferred delivery with the proviso that these orders can under no circumstances be cancelled.

Calendar

SHOWS

May 13-20—New York, Spring Salon, Hotel Commodore.

Nov. 4-10 — New York, First Automobile Exposition of the Foreign Automotive Association, Hotel Astor.

FOREIGN SHOWS

March 31 - April 29 — Madrid, Spain, International Automobile Exposition at the Palacio de Exposiciones, showing automobiles, motorcycles, accessories and equipment, under the auspices of the Chambre Syndicale de l'Automobile et du Cycle.

May 9 - June 12 — Gothenburg, Sweden, International Automobile Exhibition, Sponsored by the Royal Automobile Club of Sweden.

Oct. 4 - 14 — Paris, Passenger Cars, Bicycles, Motorcycles and Accessories, Grand Palais.

Oct. 24-Nov. 2—Paris, Trucks, Agricultural Tractors, etc., Grand Palais.

RACES

May 10 — Berlin - Grunewald, German Grand Prix.

May 30—Indianapolis, Eleventh Annual 500-mile International Sweepstakes.

July 2 — Tours, French Grand Prix 500-mile race.

CONVENTIONS

May 2, 3, 4 — New Orleans, Annual Convention of the National Foreign Trade Council.

May 7-10—New York, Annual Convention of the United States Chamber of Commerce.

May 7-12—Seville, Spain, Fourth International Highway Congress.

Oct. 24-26—Cleveland, Thirtieth Annual Convention of the National Association of Farm Equipment Manufacturers, Hotel Statler.

S. A. E. MEETINGS

Metropolitan Section

April 19—Speaker, Edw. E. La Shum. General Superintendent, Motor Vehicle Equipment, American Railway Express Co.; Subject, Engineering Features of Fleet Operation.

May 17—Speaker, F. P. Gilligan, Secretary, Henry Souther Engineering Co., Subject, Metallic Materials for Automotive Work.

Other S. A. E. Meetings

Buffalo Section — Speaker, Edward Schipper; Subject, Impressions of New York and Chicago Shows; Hotel Iroquois at 8 p.m.

Pennsylvania Section—Will Not Meet in March.

April 26-28—Automotive Transportation Meeting of the S. A. E. to be held at the Hotel Winton, Cleveland. Sessions will be devoted to truck, motor bus, taxicab and motor rail car transportation, featuring operation rather than design.

June 19-23—Summer Meeting of the S. A. E.—Spring Lake, N. J.

Oct. 25-26—Production Meeting of the S. A. E.—Cleveland.

Jan. 1924—Annual Meeting of the S. A. E.—Detroit.

MEETINGS

June 14 - 15 — Bethlehem, Pa., Eastern Sectional Meeting of the American Society for Steel Treating, Hotel Reservations made through George C. Lilly, Superintendent of Heat Treatment, Bethlehem Steel Co., Bethlehem.

June 25-July 1—Dixville Notch, N. H., Summer Meeting of the Automotive Equipment Association.

Detroit Last Month Sold 3060 New Cars

DETROIT, March 21—Sales of new cars in Detroit in February were 3060, a gain of 314 over January, according to the report compiled by the Detroit Automobile Dealers Association from registrations in the Secretary of State's office.

Truck business fell off 37, to 387, the decrease being about equally divided between light delivery and heavy duty vehicles.

In passenger car business, closed model sales exceeded open by 1583 to 1477, which represents about the same percentage as the excess for the same models in January.

Every company with the exception of one or two shared in the increases, Ford running 91 ahead and Chevrolet 13 in the low priced field with Overland and Star holding to previous totals.

Other Cars Gain

Willys - Knight showed the most marked gain in the medium priced cars with an increase from 20 to 60. Hupp increased from 102 to 164. Jewett doubled previous business. Other leaders in the medium priced field held about equal to the former month.

In the high priced field Cadillac led.

Ford car business approximated half of the entire sales total for the month and took 276 of the total 387 truck sales. Closed Ford car sales exceeded open by 23. In the medium priced field closed sales outnumbered open in most cases. With Hudson and Essex, the proportion was 100 open to 92 closed. Inversely, Hupp open exceeded closed 110 to 54. Buick, Dodge Brothers and Willys-Knight business was heavily closed.

Dallas on Upgrade

DALLAS, TEXAS, March 19—As the fourth month of the year approaches, the retail automobile business is looking even better than in the past, according to reports from Dallas retailers. Sales are still exceeding those of the same period last year and indications are that the trade for the next month will be still better.

Fort Worth retailers sold more cars during March than in any month of the last three quarters of last year. Indications for April business are bright. South Texas dealers reported sales increasing and collections good. Business is about normal in West Texas and is slow in East Texas. Truck dealers are making many sales.

New York Sales Affected by Seasonal Conditions

NEW YORK, March 20—Regulation March weather and the first quarterly payments of Federal income taxes have slackened both wholesale and retail sales of automobiles in the metropolitan territory. Dealers have been experiencing an "off" period during the first three weeks of March, as they have for the past two or three years, but with clearing weather a speeding up of business is looked for before the first of April, and sales records for the first quarter are expected to run far ahead of last year's figures.

Orders from wholesalers' territory for April delivery are coming in big volume for cars in practically all classes. Dealers out in the territory report continually improving general business conditions and a big spring market for car of truck sales in all weights continues to gain with quite frequent large installations as an encouraging factor of the revival.

Sales of new passenger cars in the territory showed an increase of 366 in February over January, according to the Automobile Sales Analysis, published by Sherlock & Arnold, the gain being among the higher priced cars.

Bond Issue Offered by National Motors

NEW YORK, March 20—New financing for the National Motors Corp., formerly Associated Motors Industries, is announced by a banking syndicate composed of Moore, Leonard & Lynch of New York and Pittsburgh; William H. Colvin & Co., Chicago, and Stroud & Co., Inc., Philadelphia and New York, in the form of an issue of $3,000,000 National Motors Corp. first mortgage 7½ per cent sinking fund ten year convertible gold bonds series A, due July 1, 1932.

The bonds will be secured by a closed first mortgage lien upon the corporation's property and are convertible, at the option of the holder, either par for par into 8 per cent cumulative preferred stock of the company or into no par value common stock on the basis of two shares of common for each $100 principal amount of bonds. The bonds are being offered at a price of 98½ and interest to yield about 7.70 per cent.

Fiat Looking to America As Outlet for Its Product

ROME, ITALY, March 3 (*by mail*)—Plans for the exploitation of the American market for the Fiat car are being made by officials of that company, according to the "Auto Italiana" which states that Engineer Fornaca, vice-president of the company, has been in the United States making a study of that market and looking over the processes used in car producing plants there.

The Lingotto plant of the Fiat Co. in Turin is now being modernized and the daily output is to be increased from 65 to 200 cars. Production of this magnitude cannot be readily absorbed in Italy, the "Auto Italiana" points out, and declares that the extension of the Fiat selling program "in the United States would be but natural."